

## EMC - TEST REPORT

Report Number	:	<b>68.760.20.0076.02</b>	Date of Issue:	<b>2020-04-23</b>
Model	:	<b>SUN2000-8KTL, SUN2000-10KTL, SUN2000-12KTL,  SUN2000-15KTL-M0, SUN2000-17KTL-M0,  SUN2000-20KTL-M0, SUN2000-8KTL-M0,  SUN2000-10KTL-M0, SUN2000-12KTL-M0  SUN2000-15KTL-M2, SUN2000-17KTL-M2  SUN2000-20KTL-M2, SUN2000-8KTL-M2  SUN2000-10KTL-M2, SUN2000-12KTL-M2</b>		
Product Type	:	Solar Inverter		
Applicant	:	Huawei Technologies Co., Ltd.		
Address	:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C		
Manufacturer	:	Huawei Technologies Co., Ltd.		
Address	:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C		
Test Result	:	<input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative		
Total pages including Appendices	:	<b>65</b>		

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**1 Report Version****Modification Record**

No.	Last Report No.	Modification Description
1	N/A	First report
2	68.760.20.0076.01	Add new models of SUN2000-15KTL-M2, SUN2000-17KTL-M2, SUN2000-20KTL-M2, SUN2000-8KTL-M2, SUN2000-10KTL-M2, SUN2000-12KTL-M2 refer to section 4.1

## 2 General Information

### 2.1 Notes

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Prepared by  
Project Engineer

2020-04-23

Date

Joe Gu

Name



Signature




Approved by  
Project Manager

2020-04-23

Date

John Zhi

Name



Signature

## 2.2 Applied Standard

Applied Product Standard:	CISPR 11:2015+A1:2016/ EN55011:2016 IEC 62920:2017*/ EN 62920:2017 IEC 61000-6-1:2005/EN 61000-6-1:2007 IEC 61000-6-3:2006+A1:2010/EN 61000-6-3:2007+A1:2011 ETSI EN 301 489-1 draft V2.2.1:2019 ETSI EN 301 489-17 draft V3.2.0:2017 IEC 61000-3-2:2014/EN 61000-3-2:2014 IEC 61000-3-3:2013/EN 61000-3-3:2013 IEC 61000-3-11:2000/EN 61000-3-11:2000 IEC 61000-3-12:2011/EN 61000-3-12:2011
Test Methods:	IEC 61000-4-2:2008 IEC 61000-4-3:2010 IEC 61000-4-4:2012 IEC 61000-4-5:2014+A1:2017 IEC 61000-4-6:2013 IEC 61000-4-8:2009

## 2.3 Test Location

Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	No.127,Jinye Road, Xi'an High-Tech Development District, Xi'an,710077,P.R.C
Test Location 2:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	No.2222,Xin Jinqiao Road, Pudong New Area, Shanghai, 201206, P.R.C

## 2.4 Details of Applicant

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product Name:	Solar Inverter
Product Model:	SUN2000-8KTL, SUN2000-10KTL, SUN2000-12KTL, SUN2000-15KTL-M0, SUN2000-17KTL-M0, SUN2000-20KTL-M0, SUN2000-8KTL-M0, SUN2000-10KTL-M0, SUN2000-12KTL-M0 SUN2000-15KTL-M2, SUN2000-17KTL-M2 SUN2000-20KTL-M2, SUN2000-8KTL-M2 SUN2000-10KTL-M2, SUN2000-12KTL-M2
Test report Number:	SYBH(E)06335098EA

## 2.5 Application Details

Date of Receipt Test Item:	2020-03-17
Start Date of Test:	2020-03-18
End Date of Test:	2020-03-29

## 2.6 Test Environment Condition

Ambient Temperature: 20–25°C

Relative Humidity: 45–55%

Atmospheric Pressure: 101kPa

### 3 Summary of Test Results

Table 1 Test summary

<b>EUT Classification:</b> Radio Equipment				
<b>Test Items</b>	<b>Test Configuration</b>	<b>Limit or Performance Criteria</b>	<b>Test Result</b>	<b>Location</b>
<u>Radiated Emissions</u> Enclosure Port	TC1(TM1-TM5) TC2(TM1-TM5)	Class B	Pass	Location1 Location2
<u>Conducted Emissions</u> <input checked="" type="checkbox"/> DC Input Power Port <input checked="" type="checkbox"/> AC Output Power Port <input checked="" type="checkbox"/> Wired network Ports	TC1(TM1-TM5) TC2(TM1-TM5)	Class B	Pass	Location1
<u>Current Harmonics Emissions</u> AC Power Port	TC1(TM1-TM5) TC2(TM1-TM5)	Refer to section 11.3	Pass	Location1
<u>Voltage Fluctuations and Flickers</u> AC Power Port	TC1(TM1-TM5) TC2(TM1-TM5)	Refer to section 11.4	Pass	Location1
<u>Electrostatic Discharge</u> Enclosure Port	TC1(TM1-TM5) TC2(TM1-TM5)	TT&TR, B	Pass	Location1
<u>Immunity to Radiated Electromagnetic Fields</u> Enclosure Port	TC1(TM1-TM5) TC2(TM1-TM5)	CT&CR, A	Pass	Location1
<u>Immunity to Electrical Fast Transient Bursts</u> <input checked="" type="checkbox"/> Outdoor Signal Port <input type="checkbox"/> Indoor Signal Port <input checked="" type="checkbox"/> AC Output Power Port <input checked="" type="checkbox"/> DC Input Power Port	TC1(TM1-TM5) TC2(TM1-TM5)	TT&TR, B	Pass	Location2
<u>Immunity to Surges</u> <input checked="" type="checkbox"/> Outdoor Signal Port <input type="checkbox"/> Indoor Signal Port <input checked="" type="checkbox"/> AC Output Power Port <input checked="" type="checkbox"/> DC Input Power Port	TC1(TM1-TM5) TC2(TM1-TM5)	TT&TR, B	Pass	Location1 Location2
<u>Immunity to Continuous Conducted Interference</u> <input checked="" type="checkbox"/> Outdoor Signal Port <input type="checkbox"/> Indoor Signal Port <input checked="" type="checkbox"/> AC Output Power Port <input checked="" type="checkbox"/> DC Input Power Port	TC1(TM1-TM5) TC2(TM1-TM5)	CT&CR, A	Pass	Location1
<u>Immunity to Power Frequency Magnetic Field</u> Enclosure Port	TC1(TM1-TM5) TC2(TM1-TM5)	CT&CR, A	Pass	Location2
<b>Note:</b> 1. Measurement taken is within the uncertainty of measurement system. 2. TC is short for test configuration. 3. <input checked="" type="checkbox"/> The item has been tested; <input type="checkbox"/> The item has not been tested or not applicable.				

## 4 Equipment Specification

### 4.1 General Description

The SUN2000 receives inputs from up to two PV strings. Then the inputs are grouped into two MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

There are fifteen models in this report, and the model differences are shown in the following table :

Table 2 Model difference table

Module	Power(kW)	485 communication	MBUS	WLAN
SUN2000-8KTL	8.00	√	×	√
SUN2000-10KTL	10.0	√	×	√
SUN2000-12KTL	12.00	√	×	√
SUN2000-8KTL-M0	8.00	√	×	√
SUN2000-10KTL-M0	10.00	√	×	√
SUN2000-12KTL-M0	12.00	√	×	√
SUN2000-15KTL-M0	15.00	√	×	√
SUN2000-17KTL-M0	17.00	√	×	√
SUN2000-20KTL-M0	20.00	√	×	√
SUN2000-8KTL-M2	8.00	√	√	√
SUN2000-10KTL-M2	10.00	√	√	√
SUN2000-12KTL-M2	12.00	√	√	√
SUN2000-15KTL-M2	15.00	√	√	√
SUN2000-17KTL-M2	17.00	√	√	√
SUN2000-20KTL-M2	20.00	√	√	√

Note: √ : have this function; × : have not this function;

### 4.2 Specification

Table 3 Main equipment specification

Max Input Voltage	=== 1080V
MPP Range	=== 160V to 950V
Rated Power (W)	8kW/10kW/12kW/15kW/17kW/20kW
Output Voltage	220V/380V, 230V/400V, (50/60Hz) 3W+N+PE
Dimensions(W x D x H)	525mm (W) x 470 mm (D) x 262 mm (H)
Weight (kg)	≤25kg
Transmit and Receiver frequency	WLAN: 2400MHz-2483.5MHz
Frequency of the Internal Source (MHz)	12MHz, 24MHz, 433MHz, 2400MHz





Figure 1. EUT appearance

#### 4.3 Subassembly

Table 4 Subassembly list

Subassembly			
Subassembly Name	Model	Manufacturer	Description
Smart Dongle-WLAN-FE	SDongleA-05	Huawei	/

## 5 System Configuration during EMC Test

The Equipment under test (EUT) functions correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical configuration.

### 5.1 Ports and Cables

Table 5 Port and cables

Port	Quantity	Length (m)	Connector	Type of Cable
AC output Power Port	1	5m	NA	Unshielded
DC input Power Port <sup>1</sup>	2	10m	H4	Unshielded
FE Port	1	10m	RJ45	From FE Dongle, Shielded
485 Port	1	10m	NA	Shielded Cable
Earth	1	2m	/	Earthing cable

### 5.2 Auxiliary Equipment

Table 6 Auxiliary equipment

Name	Model	Manufacturer	S/N	Calibration Date	Cal Interval (month)
DC-Source	62150H-1000S	Chroma	NA	2019/5/7	12
DC-Source	62150H-1000S	Chroma	NA	2019/5/7	12
DC-Source	62150H-1000S	Chroma	NA	2020/1/29	12
MX45	3Pi-380-SNK-LF-HV (400V)	Ametek	NA	2019/10/8	12
PC	E73	lenovo	A160640388	NA	NA
Mobile phone	mate20	Huawei	66J0118620000471	NA	NA
PV optimizer	SUN2000-375W-P	Huawei	2102312LFH	NA	NA
Smart Dongle-WLAN	SDongleA-01	Huawei	/	NA	NA
Smart Dongle-4G	SDongleA-03	Huawei	/	NA	NA

### 5.3 Test Configurations and mode

As shown in table 2, the differences between nine models(SUN2000-8KTL, SUN2000-10KTL, SUN2000-12KTL, SUN2000-15KTL-M0, SUN2000-17KTL-M0, SUN2000-20KTL-M0,SUN2000-8KTL-M0,SUN2000-10KTL-M0, SUN2000-12KTL-M0) were only the output power and model name, all other is the same, the test is done on the largest power type SUN2000L-20KTL-M0 as TC1 which is most severe for EMC.

The differences between six models (SUN2000-8KTL-M2, SUN2000-10KTL-M2, SUN2000-12KTL-M2, SUN2000-15KTL-M2, SUN2000-17KTL-M2, SUN2000-20KTL-M2) were only the output power and model name, all other is the same, the test is done on the largest power type SUN2000L-20KTL-M2 as TC2 which is most severe for EMC.

The differences between models SUN2000-8KTL-M0, SUN2000-10KTL-M0, SUN2000-12KTL-M0, SUN2000-15KTL-M0, SUN2000-17KTL-M0, SUN2000-20KTL-M0 and SUN2000-8KTL-M2, SUN2000-10KTL-M2, SUN2000-12KTL-M2, SUN2000-15KTL-M2, SUN2000-17KTL-M2, SUN2000-20KTL-M2 were all models with M2 have MBUS function, all models with M0 do not have MBUS function, all other is the same, the test is done on the largest power type SUN2000L-20KTL-M0 and as SUN2000L-20KTL-M2 which is most severe for EMC.

The EUT was connected to auxiliary equipment in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

There were two test configurations and five test modes which were shown in the following table and figures:

Table 7 Test configuration and mode

Configuration	Configuration Description	Test Mode	Test Mode Description
TC1	SUN2000-20KTL-M0	TM1	100% load with FE module working
		TM2	10% load with 4G module working
		TM3	10% load with WALN module working
		TM4	10% load with FE module working
		TM5	Standby mode
TC2	SUN2000-20KTL-M2	TM1	100% load with FE module working
		TM2	10% load with 4G module working
		TM3	10% load with WALN module working
		TM4	10% load with FE module working
		TM5	Standby mode

Note: For TM1-TM4 test mode, the test covered high, middle and low three MPPT voltage.

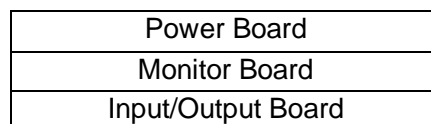


Figure 2. Test configuration for TC1, TC2

#### 5.4 Test Condition and Connection

The SUN2000 convert the DC input voltage into 230V AC output voltage, then supply to the user. During emission and immunity test, All functions should work in typical condition;

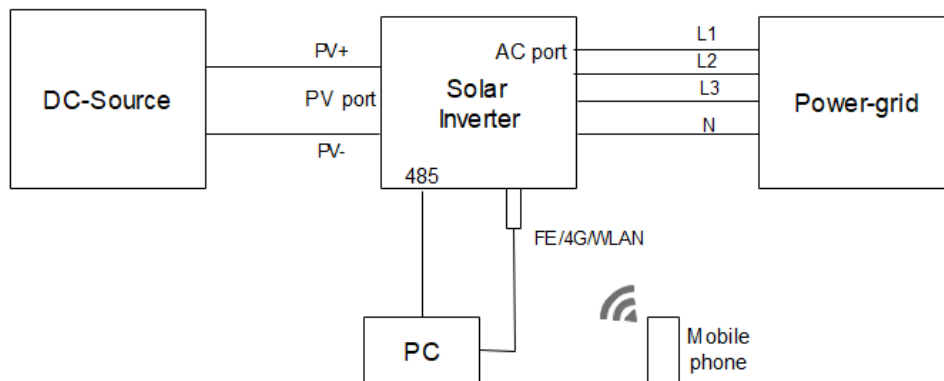


Figure 1. Test connection for TC1

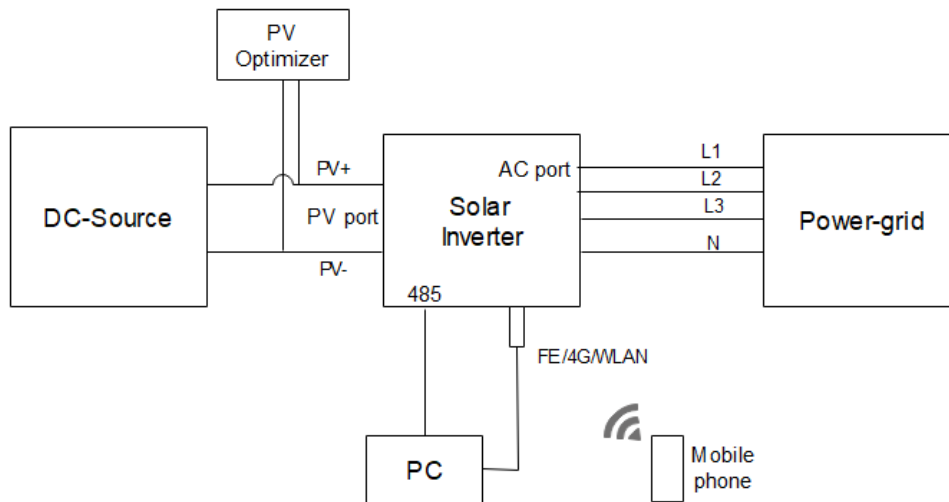


Figure 2. Test connection for TC2

## **6 Immunity Performance Criteria**

During immunity test, the EUT is to be monitored for compliance against the performance "CT&CR, TT&TR,A,B" criteria as appropriate for the particular test applied. The "pass/fail" performance criterion to be used during test is detailed below:

### **6.1 Performance Criterion CT&CR (Continuous Phenomena)**

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted. During test, the EUT shall operate as intended, after test, the EUT shall operate as intended with no loss of user control function, or stored data, the communication link shall be maintained.

### **6.2 Performance Criterion TT&TR (Transient Phenomena)**

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted. During test, the EUT May show loss of function (one or more), show degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended, but no unintentional transmissions.

After test, the EUT shall operate as intended with no loss of user control functions or stored data, the communications link shall be maintained

### **6.3 Performance Criterion A**

The apparatus shall continue to operate as intended. 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. In some cases 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, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

### **6.4 Performance 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. In some cases the performance level may be replaced by a permissible loss of performance. During the exposure to an electromagnetic phenomenon, degradation of performance is, however, allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

## 7 Electromagnetic Interference (EMI)

### 7.1 Radiated Emission 30 MHz to 6 GHz

#### 7.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB in accordance with the standard CISPR 16-1-4. The test distance was 10 m for 30 MHz to 1 GHz.

The test site full-anechoic chamber has met the requirement of  $S_{VSWR}$  tolerance 6 dB in accordance with the standard CISPR 16-1-4. The test distance was 3 m for 1 GHz to 6 GHz.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 6 GHz by using test software script; the emissions were measured using Quasi-Peak Detector (30 MHz-1 GHz) and Average/Peak Detector (above 1 GHz). The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software set-up. Normally, the antenna height ranged from 1 m to 4 m, and the turntable azimuth ranged from 0° to 360°. The receive antenna has two polarizations: Vertical and Horizontal.

The set-up and test methods were in accordance with CISPR 11, CISPR 16-2-3 and EN 55032/CISPR 32 standards. The test set-up diagram is shown as below:

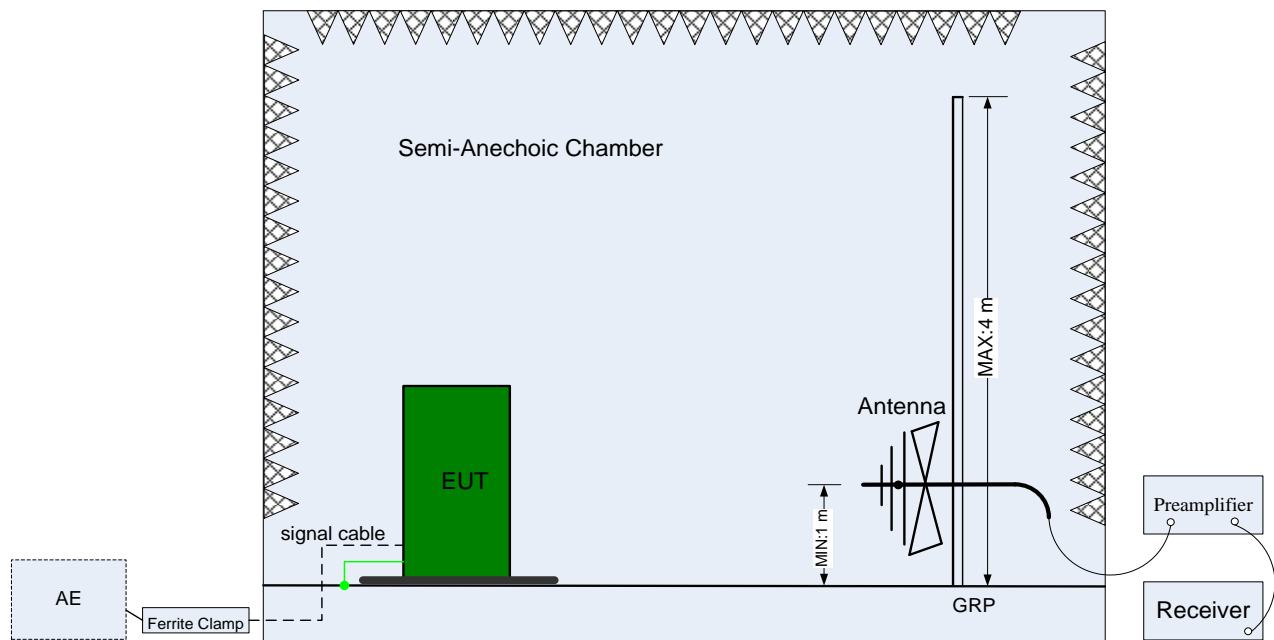


Figure 3. Test set-up of radiated disturbance (30MHz-1GHz)

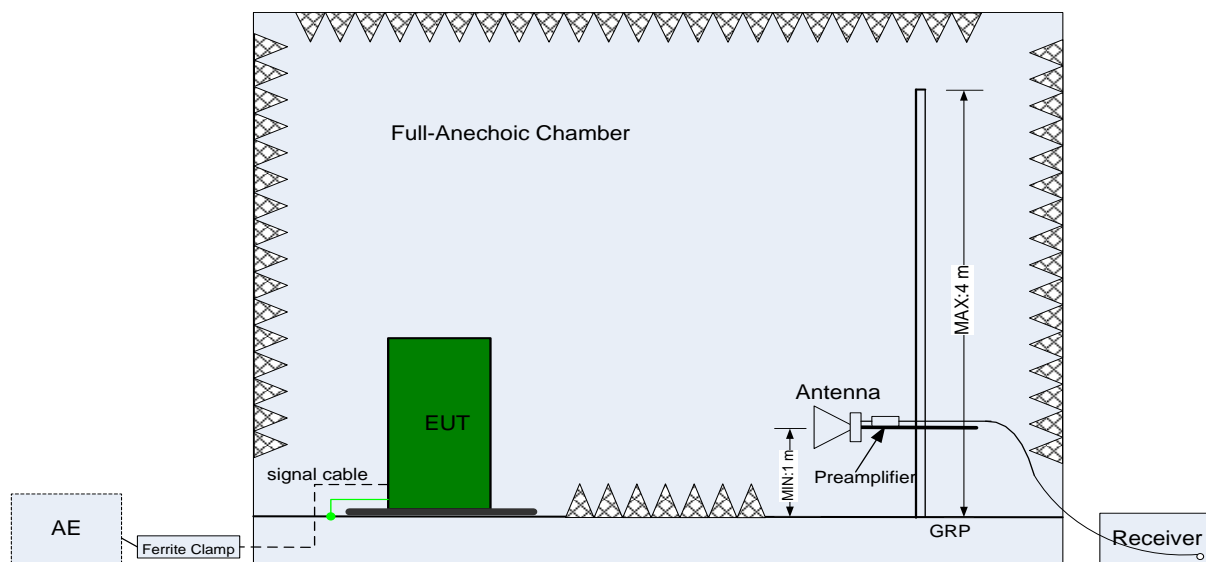


Figure 4. Test set-up of radiated disturbance (above 1GHz)

### 7.1.2 Test Limit

Table 8 Test limits of 30 MHz to 1 GHz at a measuring distance of 10m

Class A	
Frequency	Limit
30 MHz to 230 MHz	40 dB $\mu$ V/m
230 MHz to 1 GHz	47 dB $\mu$ V/m
Class B	
Frequency	Limit
30 MHz to 230 MHz	30 dB $\mu$ V/m
230 MHz to 1 GHz	37 dB $\mu$ V/m

Table 9 Test limits of 1GHz to 6GHz at a measuring distance of 3m

Class A		
Frequency	AV	PK
1GHz to 3 GHz	56 dB $\mu$ V/m	76 dB $\mu$ V/m
3 GHz to 6 GHz	60 dB $\mu$ V/m	80 dB $\mu$ V/m
Class B		
Frequency	AV	PK
1GHz to 3 GHz	50 dB $\mu$ V/m	70 dB $\mu$ V/m
3 GHz to 6 GHz	54 dB $\mu$ V/m	74 dB $\mu$ V/m

### 7.1.3 Test Results

The EUT has met the requirements for radiated emission of the enclosure port.  
For the test data, see section 11.1.

Table 10 Test Result

Test Configuration	Frequency Range	Distance(m)	Limit	Result
TC1(TM1-TM5) TC2(TM1-TM5)	30MHz to 1GHz	10m	Class B	Pass
TC1(TM1-TM5) TC2(TM1-TM5)	1GHz to 6GHz	3m	Class B	Pass

Note: The highest frequency of the internal sources of the EUT is 2400MHz; the measurement was made up to 6GHz.

## 7.2 Conducted Disturbance 0.15 MHz to 30 MHz

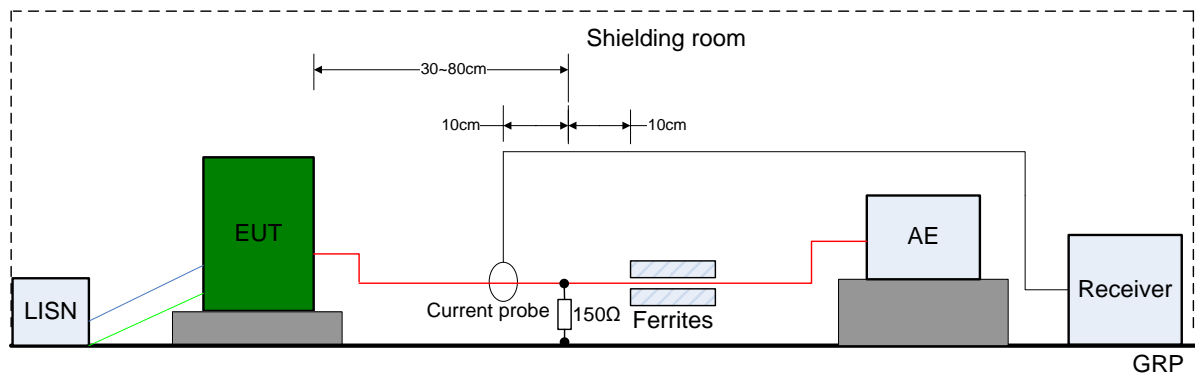
### 7.2.1 Test Procedure

The EUT was configured as described in section 5 for this test. The mains cable of the EUT must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8 m from the LISN.

All wired network and signal ports must be correctly terminated using either appropriate associated equipment or a representative termination during the measurement of the conducted disturbances at the mains.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

The set-up of Conducted Disturbance for power port and telecommunication port were in accordance with CISPR 11 and EN 55032/CISPR 32 standards. The test set-up diagram is shown as below:



Note: The 150  $\Omega$  resistance was connected to the outside surface of the shield.

Figure 5. Test set-up of conducted disturbance for wired network port (shielded cable)

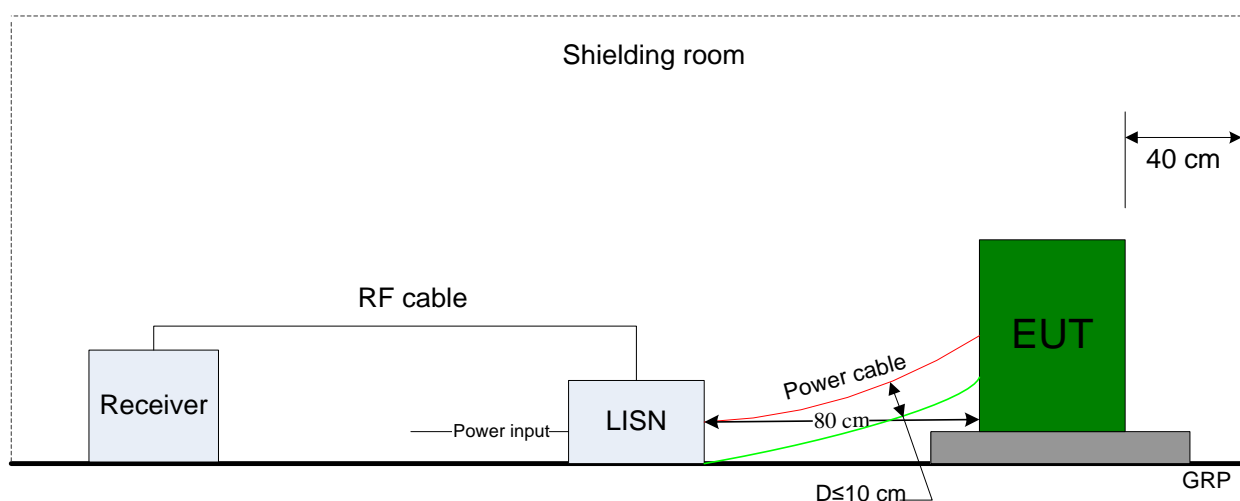


Figure 6. Test set-up of conducted disturbance for AC power port



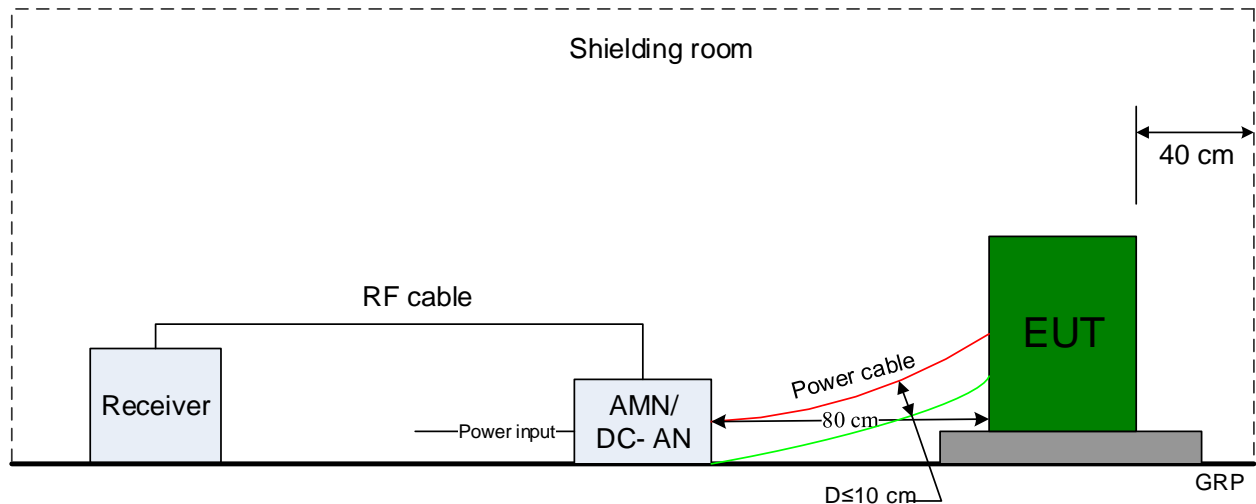


Figure 7. Test set-up of conducted disturbance for DC power port

## 7.2.2 Test Limit

Table 11 Limits of wired network ports

Class A				
Frequency	Voltage limits (dB $\mu$ V)		Current limits (dB $\mu$ A)	
	QP	AV	QP	AV
0.15 to 0.5 MHz	97 to 87	84 to 74	53 to 43	40 to 30
0.5 to 30 MHz	87	74	43	30
Class B				
Frequency	Voltage limits (dB $\mu$ V)		Current limits (dB $\mu$ A)	
	QP	AV	QP	AV
0.15 MHz to 0.5 MHz	84 to 74	74 to 64	40 to 30	30 to 20
0.5 MHz to 30 MHz	74	64	30	20

Table 12 Limits of AC power port

Class A		
Frequency	Voltage limits (dB $\mu$ V)	
	QP	AV
0.15 MHz to 0.5 MHz	79	66
0.5 MHz to 30 MHz	73	60
Class B		
Frequency	Voltage limits (dB $\mu$ V)	
	QP	AV
0.15 MHz to 0.5 MHz	66 to 56	56 to 46
0.5 MHz to 5 MHz	56	46
5 MHz to 30 MHz	60	50

Table 13 Limits of DC power port

Class A (Rated power $\leq 20\text{kW}$ )		
Frequency	Voltage limits (dB $\mu$ V)	
	QP	AV
0.15 MHz to 5 MHz	97 to 89	84 to 76
5 MHz to 30 MHz	89	76
Class B		
Frequency	Voltage limits (dB $\mu$ V)	
	QP	AV
0.15 MHz to 5 MHz	84 to 74	74 to 64
5 MHz to 30 MHz	74	64

### 7.2.3 Test Results

The EUT has met requirements for conducted disturbance.

For the test data, see section 11.2.

Table 14 Test result of conducted disturbance

Test Configuration	Ports	Cable Type	Sampling Network	Limit	Result
TC1 (TM1-TM5) TC2 (TM1-TM5)	AC output port	/	ENV4200	Class B	Pass
TC1 (TM1-TM5) TC2 (TM1-TM5)	DC input port	/	PVDC8301	Class B	Pass
TC1 (TM1-TM5) TC2 (TM1-TM5)	485	Shielded	Current Probe	Class B	Pass
TC1 (TM4) TC2 (TM4)	FE	Shielded	Current Probe	Class B	Pass

### 7.3 Current Harmonics Emissions

#### 7.3.1 Test Procedure

The EUT was configured as described in section 5. The set-up and test methods were in accordance with EN 61000-3-2/EN 61000-3-12 standards.

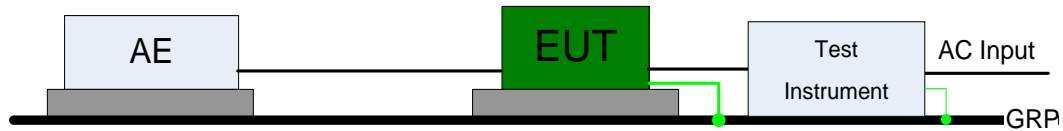


Figure 8. Test set-up of current harmonics emission test

#### 7.3.2 Test Results

The EUT has met the requirements (Class A) specified in EN 61000-3-2 and met the requirement for other than balanced equipment specified in EN 61000-3-12 for current harmonics emission of AC output Power Port.

For the test data, see section 11.3.

### 7.4 Voltage Fluctuations and Flicker

#### 7.4.1 Test Procedure

The EUT was configured as described in section 5. The formal test ran a period of 2 hours.  $P_{lt}$ ,  $P_{st}$ ,  $d(t)$ ,  $d_{max}$  and  $d_c$  is measured. The set-up and test methods were in accordance with EN 61000-3-3/EN 61000-3-11 standards.

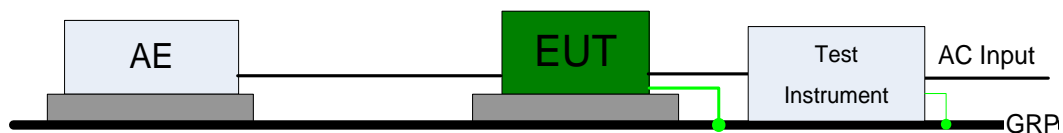


Figure 9. Test set-up of voltage fluctuations test

#### 7.4.2 Test Results

The EUT has met the requirements of EN 61000-3-3/EN 61000-3-11 for voltage fluctuations and flicker of AC output Power Port.

For the test data, see section 11.4.

## 8 Electromagnetic Susceptibility (EMS)

### 8.1 Electrostatic Discharge

#### 8.1.1 Test Procedure

The EUT was configured as described in section 5 for this test. The set-up and test methods were in accordance with IEC 61000-4-2 standard.

The test environment condition was recorded in the following table:

Table 15 Test environment condition during ESD test

Ambient temperature	25°C
Relative humidity	50%
Atmospheric pressure	101kPa

The test set-up diagram is shown as below:

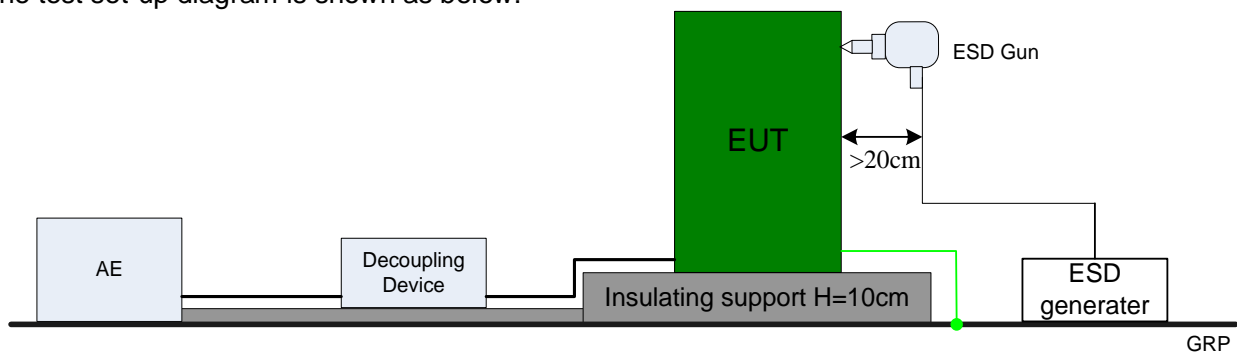


Figure 10. Test set-up of electrostatic discharge

#### 8.1.2 Test Results

The EUT has met the requirements of Performance Criterion TT&TR and B defined in section 6.

All of the discharge points were presented in the table below, each discharge point was tested for 20 times (10 times for positive and negative), the minimum discharge interval was 1 second.

Table 16 Test results

Test Point	Discharge Mode	Test Level (kV)	Performance Criterion	Description	Result
Vertical coupling plane-front, rear, left, right	C	±2, ±4, ±6	TT&TR,B	No failure detected	Pass
Cabinet enclosure	C	±2, ±4, ±6	TT&TR,B	No failure detected	Pass
Connectors	C	±2, ±4, ±6	TT&TR,B	No failure detected	Pass
Screw of frames	C	±2, ±4, ±6	TT&TR,B	No failure detected	Pass
Radiator hole	A	±2, ±4, ±8	TT&TR,B	No failure detected	Pass
Indication lamp	A	±2, ±4, ±8	TT&TR,B	No failure detected	Pass

Note: The discharge mode: "C" means Contact Discharge, "A" means Air Discharge

## 8.2 Immunity to Radiated Electric Fields 80 MHz to 6000 MHz

### 8.2.1 Test Procedure

The EUT was configured as described in section 5. The set-up and test methods were in accordance with IEC 61000-4-3 standard. All sides of the EUT (front, rear, left and right) were tested using an antenna with vertical and horizontal polarization.

Table 17 Test requirements

Test Side of EUT	Front, rear, left and right
Field Modulation	80% amplitude modulation at 1kHz sine wave
Exclusion Band	WLAN: 2400MHz-2483.5MHz
Maximum Step Size	1%
Swept-Frequency Dwell Time	1 second
Special Frequency points	80 MHz; 120 MHz; 160 MHz; 230 MHz; 434 MHz; 433MHz; 450 MHz; 460 MHz; 600 MHz; 850 MHz; 863 MHz; 900 MHz; 1800 MHz; 1950MHz; 2100 MHz and 2400 MHz ( $\pm 1\%$ ).
Special Frequency Dwell Time	60 seconds

The test set-up diagram is shown as below:

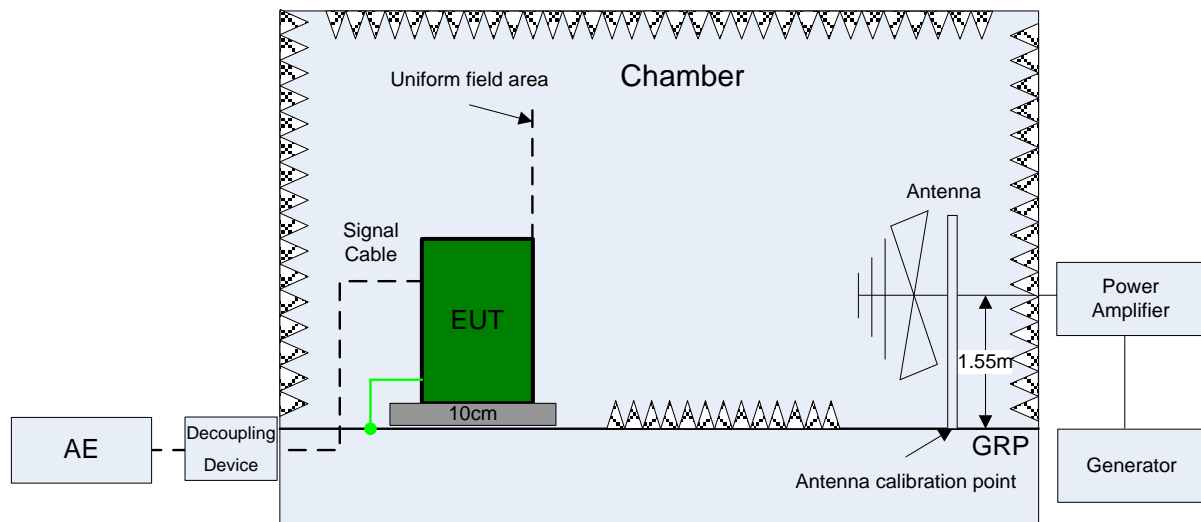


Figure 11. Test set-up of immunity to radiated electric fields

### 8.2.2 Test Results

The EUT has met the requirements of Performance Criterion CT&CR and A defined in section 6 for Immunity to Radiated Electric Fields of enclosure port.

Table 18 Test results

Frequency Range	Polarization	Test Level (Unmodulated, rms)	Performance Criterion	Description	Result
80MHz to 1000MHz	Horizontal and Vertical	10V/m (rms)	CT&CR, A	No failure detected	Pass
1000MHz to 6000MHz	Horizontal and Vertical	10V/m (rms)	CT&CR, A	No failure detected	Pass

### 8.3 Immunity to Electrical Fast Transient Bursts

#### 8.3.1 Test Procedure

The EUT was configured as described in section 5. A series of fast transient bursts meeting the specification were applied for a period of 120 seconds. The transient bursts were applied for both Positive and Negative Burst Trains to each type of signal port and power Port. The set-up and test methods were in accordance with IEC 61000-4-4 standard.

Table 19 Parameter of single pulse and fast transient /burst

Rise Time of Single Pulse (Tr):	5 ns
Duration of Single Pulse (Th):	50 ns
Pulse Repetition Rate:	5 kHz, 100kHz
Burst Duration :	15 ms
Burst Period:	300 ms

The test set-up diagram is shown as below:

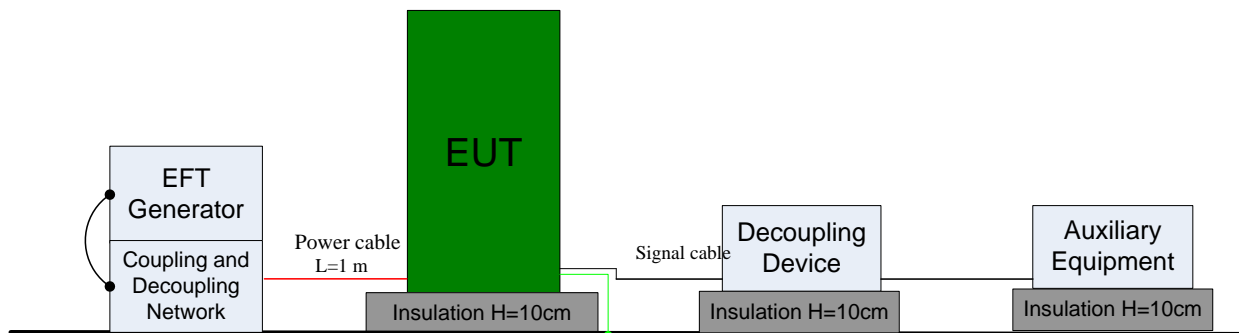


Figure 12. Test set-up of electrical fast transient bursts for power port of floor-standing equipment

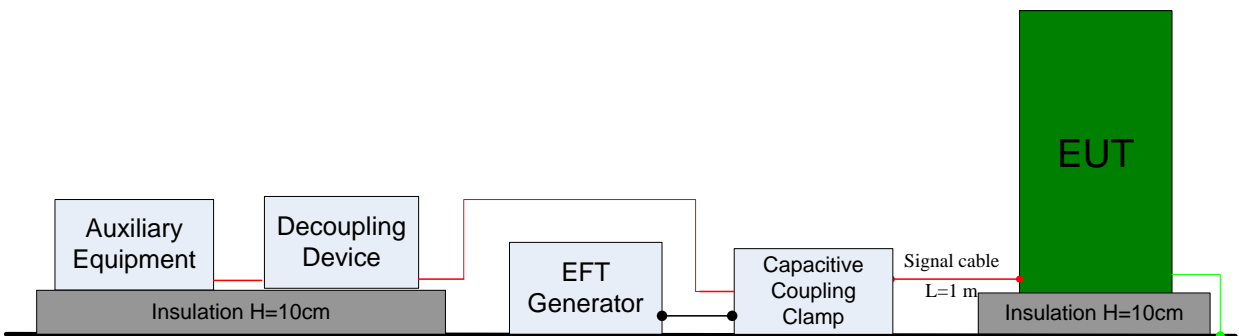


Figure 13. Test set-up of electrical fast transient bursts for signal port of floor-standing equipment

### 8.3.2 Test Results

The EUT has met the requirements of Performance Criterion TT&TR and B defined in section 6.

Table 20 Test results

Ports	Coupling Mode	Test Level	Duration	Performance Criterion	Description	Result
AC	L1	$\pm 1\text{kV}/2\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
AC	L2	$\pm 1\text{kV}/2\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
AC	L3	$\pm 1\text{kV}/2\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
AC	N	$\pm 1\text{kV}/2\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
AC	PE	$\pm 1\text{kV}/2\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
AC	L1+L2+L3+N+PE	$\pm 1\text{kV}/2\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
DC	CDN 163 (160)	$\pm 1\text{kV}/2\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
485	CDN8014	$\pm 1\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass
FE	CDN8014	$\pm 1\text{kV}$	2 minutes	TT&TR, B	No failure detected	Pass

## 8.4 Immunity to Surges

### 8.4.1 Test Procedure

The EUT was configured as described in section 5 for this test. The set-up and test methods were in accordance with IEC 61000-4-5 standard.

The test set-up diagram is shown as below:

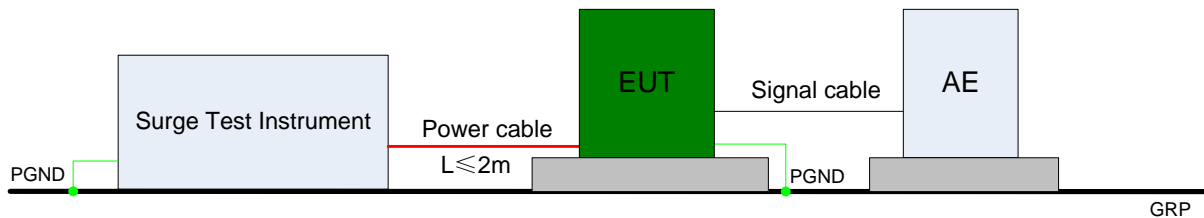


Figure 14. Test set-up of immunity to surge for power port

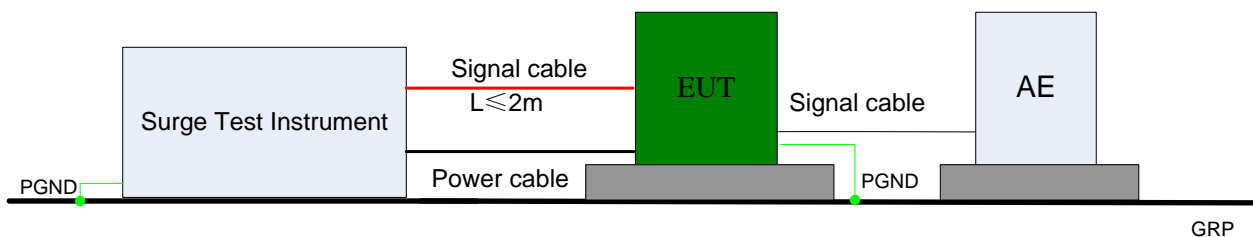


Figure 15. Test set-up of immunity to surge for signal Port

### 8.4.2 Test Results

The EUT has met the requirements of Performance Criterion TT&TR and B defined in section 6.

Table 21 Test results

Ports	Waveform (μs)	Coupling Mode	Coupling Impedance (ohm)	Phase	Test Level	Rep Times	Description	Result
AC	1.2/50	L1-L2	2	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
AC	1.2/50	L1-L3	2	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
AC	1.2/50	L2-L3	2	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
AC	1.2/50	L1-N	2	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
AC	1.2/50	L2-N	2	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
AC	1.2/50	L3-N	2	0°, 90°	±6kV	5	No failure	Pass



				180°, 270°			detected	
AC	1.2/50	L1-PE	12	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
AC	1.2/50	L2-PE	12	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
AC	1.2/50	L3-PE	12	0°, 90°, 180°, 270°	±6kV	5	No failure detected	Pass
DC	1.2/50	PV(+) to PV(-)	2	Asyn	±4kV	5	No failure detected	Pass
DC	1.2/50	PV(+) to ground	12	Asyn	±4kV	5	No failure detected	Pass
DC	1.2/50	PV(-) to ground	12	Asyn	±4kV	5	No failure detected	Pass
485	1.2/50	Line to line	42	Asyn	±4kV	5	No failure detected	Pass
485	1.2/50	Line to ground	42	Asyn	±6kV	5	No failure detected	Pass
485	10/700	Line to line	40	Asyn	±4kV	5	No failure detected	Pass
485	10/700	Line to ground	40	Asyn	±6kV	5	No failure detected	Pass
FE	1.2/50	Line to line	42	Asyn	±1.5kV	5	No failure detected	Pass
FE	1.2/50	Line to ground	42	Asyn	±4kV	5	No failure detected	Pass
FE	10/700	Line to line	40	Asyn	±1.5kV	5	No failure detected	Pass
FE	10/700	Line to ground	40	Asyn	±4kV	5	No failure detected	Pass

## 8.5 Immunity to Continuous Conducted Interference 0.15 MHz to 80 MHz

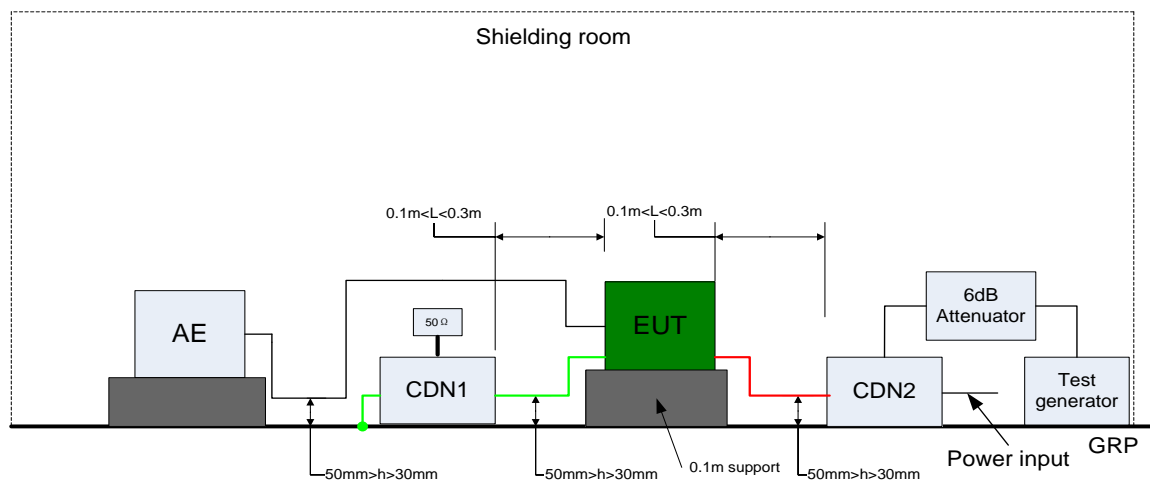
### 8.5.1 Test Procedure

The EUT was configured as described in section 5. The applied level was amplitude modulated by a 1 kHz sinusoidal signal to a modulation depth of 80%. The set-up and test methods were in accordance with IEC 61000-4-6 standard.

## Table 22 Test requirements

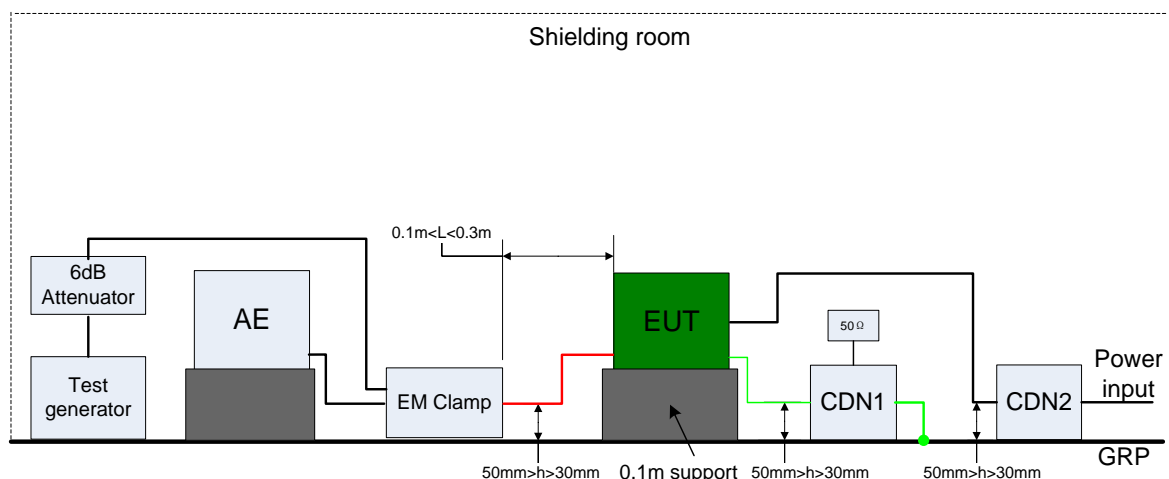
Sweep Frequency Range:	0.15 MHz to 80 MHz
Field Modulation:	80% Amplitude modulation at 1kHz sine wave
Maximum Step Size:	1%
Swept-Frequency Dwell Time:	1 second
Special Frequency Point:	0.2 MHz; 1.0 MHz;7.1 MHz;12MHz;13.56 MHz; 21.0 MHz; 24MHz; 27.12 MHz; 40.68 MHz;
Special Frequency Dwell Time:	60 seconds

The test set-up diagram is shown as below:



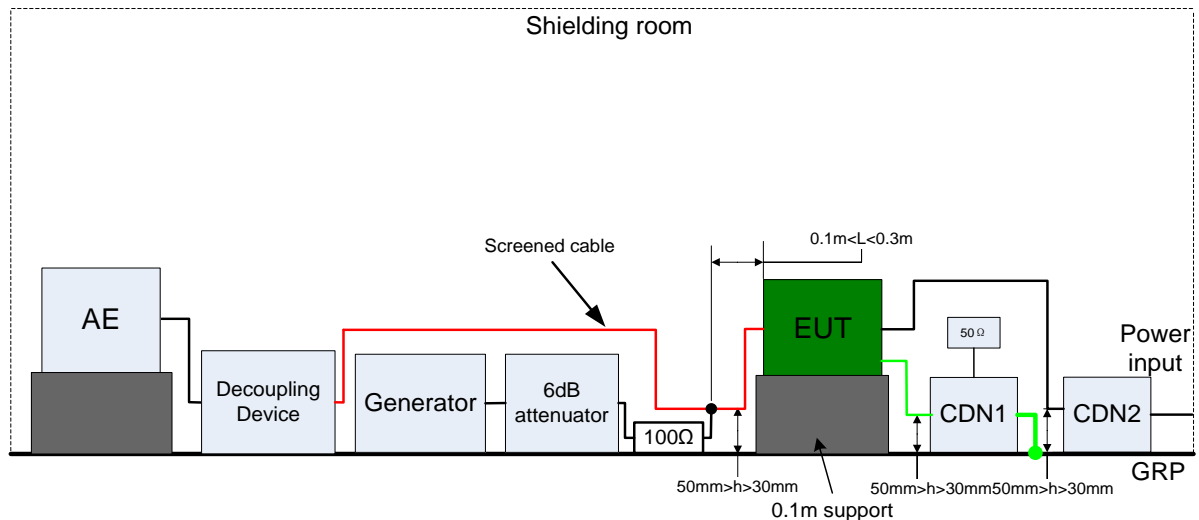
The cable connected to the EUT: red is power cable; green is earthing cable; black is signal cable

**Figure 16.** Test set-up of immunity to continuous conducted interference for power port



The cable connected to the EUT: red is signal cable; green is earth cable; black is power cable

Figure 17. Test set-up of immunity to continuous conducted interference for unshielded cable



The cable connected to the EUT: red is screened signal cable; green is earth cable; black is power cable

**Figure 18.** Test set-up of immunity to continuous conducted interference for signal port with shielded cable

### 8.5.2 Test Results

The EUT has met the requirements of Performance Criterion CT&CR and A defined in section 6 for immunity to continuous conducted interference

**Table 23** Test results of signal ports

Port	Cable Type	Test Level (Unmodulated)	Coupling Method	Description	Conclusion
485	Shielded	10 V (rms)	Direct inject	No failure detected	Pass
FE	Shielded	3 V (rms)	Direct inject	No failure detected	Pass

**Table 24** Test results of DC input Power Port and Bat Port

Ports	Test Level (Unmodulated)	Inject method	Description	Conclusion
DC input Power Port	10 V (rms)	RF Inject Clamp	No failure detected	Pass

**Table 25** Test results of AC output Power Port

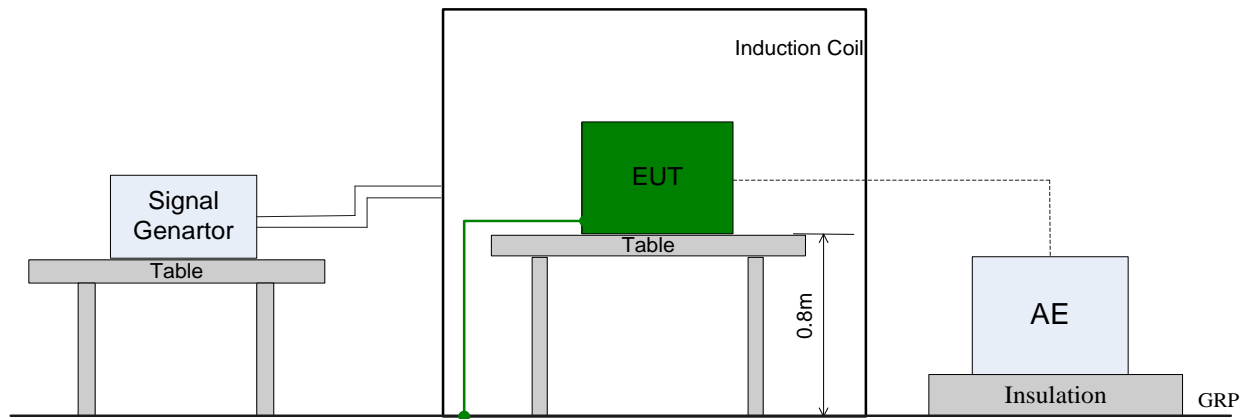
Ports	Test Level (Unmodulated)	Inject method	Description	Conclusion
AC output Power Port	10 V (rms)	CDN-M5	No failure detected	Pass
Earth	10 V (rms)	CDN-M1	No failure detected	Pass

## 8.6 Immunity to Power Frequency Magnetic Field

### 8.6.1 Test Procedure

The EUT was configured as described in section 5. The set-up and test methods were in accordance with IEC 61000-4-8 standard.

The test set-up diagram is shown as below:



### 8.6.2 Test Results

The EUT has met the requirements of Performance Criterion CT&CR and A defined in section 6 for immunity to power frequency magnetic field of enclosure port.

Table 26 Test results

Coil Position	Three orthogonal position X Y Z
Test Level	30 A/m
Duration Time	1 min
Criterion	CT&CR,A
Description	No failure detected
Conclusion	Pass

## 9 Main Test Instruments

Table 27 Main test instruments

Test item	Test Instrument	Model (S/N)	Manufacturer	Calibration Date	Calibration Interval (month)
3m Radiated Emission (Location 1)	Receiver	N9038A (MY55420108)	KEYSIGHT	2019-07-02	12
	Horn antenna	BBHA 9120D (9120D#1453)	Schwarzbeck	2018-06-12	24
	Chamber _S <sub>VSWR</sub>	3m chamber	Albatross	2018-10-20	24
10m Radiated Emission (Location 2)	EMI Test receiver	ESU40 (100303)	R&S	2019-10-26	12
	Bilog antenna	VULB 9163 (480)	SCHWARZBECK	2018-10-17	24
	Bilog antenna	VULB 9163 (548)	SCHWARZBECK	2018-05-05	24
	Chamber _NSA	3m chamber	Albatross	2018-12-01	24
Conducted Emission (Location 1)	Receiver	ESCI (101334)	R&S	2019-06-20	12
	Artificial mains network	ENV4200 (100086)	R&S	2019-04-17	12
	Artificial network	PVDC 8301RC (8301-35)	SCHWARZBECK	2019-04-17	12
	Current probe	EZ-17 (100466)	R&S	2019-04-18	12
Current Harmonics Voltage fluctuation and Flicker (Location 1)	Power Analyser WT3000	36090900139	YOKOGAWA	2020-01-29	12
	Current Sensor CT6863	A170410202	HIOKI	2020-01-14	12
	AC Source MX45	A171111507	California Instrument	2019-10-08	12
	62150H-1000S	A120321639	Chroma	2020-01-29	12
Electrostatic Discharge (Location 1)	ESD simulator	NSG437 (1105)	TESEQ	2019-07-09	12
Immunity to Radiated Electric Fields (Location 1)	Signal generator	N5173B (MY53270579)	KEYSIGHT	2019-04-03	12
	transmitting antenna	VULP9118E (9118E950)	Schwarzbeck	NA	NA

	transmitting antenna	STLP9149 (9149-379)	Schwarzbeck	NA	NA
	Amplifier (80MHz-1GHz)	80RF1000-600 (1071455)	Milmega	2019-10-14	12
	Amplifier (1GHz-2GHz)	AS0102-200 (1071456)	Milmega	2019-10-14	12
	Amplifier (2GHz-6GHz)	BLMA 2060-200S (1510442)	Milmega	2019-10-14	12
	Power meter	N1914A (MY55446002)	KEYSIGHT	2019-10-14	12
	Power probe	E9304A (MY55360010)	KEYSIGHT	2019-10-14	12
	Power probe	E9304A (MY55370015)	KEYSIGHT	2019-10-14	12
Electrical Fast Transient Bursts (Location 2)	Capacitive Coupling clamp	CDN 8014 (29190)	TESEQ	2019-04-08	12
	Fast transient burst simulator	NSG3060 (208)	TESEQ	2019-04-08	12
SURGE (Location 1)	1.2/50 Surge generator	NSG3060 (1798)	TESEQ	2019-04-03	12
	10/700 Surge generator	NSG 2050 (200930-664LU)	TESEQ	2019-04-02	12
	Surge Coupling Network	SCN01 (SCN-01003)	HUAWEI	2019-04-03	12
	Surge Coupling Network	SCN02 (SCN-02006)	HUAWEI	2019-04-02	12
SURGE (Location 2)	High energy pulse generator	CWS1000G (ES3521701)	3Ctest	2019-10-21	12
	Coupling decoupling network	SPN1550T (ES4221701)	3Ctest	2019-10-24	12
	Coupling decoupling network	SPN1550T (ES4221702)	3Ctest	2019-10-24	12
	High energy pulse generator	CWS 1000CT (ES3531801)	3Ctest	2019-04-22	12
	Coupling decoupling network	CNV 503S12 (V1231113305)	EMTEST	2019-07-25	12
	Coupling decoupling network	CNV 503S10 (V1121109604)	EMTEST	2019-07-25	12

	Coupling decoupling network	CNV504 S9 (V1121109605)	EMTEST	2019-07-25	12
	Coupling decoupling network	CNV504 N3.3 (V1121109607)	EMTEST	2019-07-25	12
	Coupling decoupling network	SCN-02 (SCN-02008)	Huawei	2019-10-21	12
Immunity to Continuous Conducted Interference (Location 1)	Signal generator	NSG4070 (28186)	TESEQ	2019-04-07	12
	6dB attenuator	ATN 6075 (27184)	TESEQ	2019-04-16	12
	Coupling decoupling network	FCC-801-M1-50A (100247)	FCC	2019-04-16	12
	100Ω resistor	CR100 (705)	LUTHI	2019-04-15	12
	Coupling decoupling network	CDN M532S (44598)	TESEQ	2019-04-15	12
	Electromagnetic clamp	KEMZ 801 (28534)	TESEQ	2019-06-20	12
Power Frequency Magnetic Field (Location 2)	Power source	NET Wave 7 (V1129110285)	EMTEST	2019-10-23	12
	Helmholtz coil	HHS 5215-100 (5215-100 102)	SCHWARZB ECK	2019-10-23	12
Software Information					
Test Item		Software Name	Manufacturer	Version	
Radiated Emission (3m) (Location 1)		EMC32	R&S	V8.5.3	
Radiated Emission (10m) (Location 2)		EP7	TOYO	V5.8.0	
Conducted Emission (Location 1)		EMC32	R&S	V8.3	
Immunity to Radiated Electric Fields (Location 1)		Emcware	AR	V2.7.0	
Immunity to Continuous Conducted Interference (Location 1)		EMC32	R&S	V8.5.1	
Current Harmonics Voltage fluctuation and Flicker (Location 1)		IEC61000 Analysis	YOKOGAWA	V6.22	

## 10 System Measurement Uncertainty

For a 95% confidence level, the measurement extended uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items		Extended Uncertainty
3m Radiated emission (Location1)	Field strength (dB $\mu$ V/m)	$U=5.7$ dB; $k=2$ (30MHz to 1GHz)
		$U=5.3$ dB; $k=2$ (1GHz to 6GHz)
Radiated emission (10m chamber)	Field strength (dB $\mu$ V/m)	$U=5.6$ dB; $k=2$ (30MHz-1GHz)
		$U=5.5$ dB; $k=2$ (1GHz-6GHz)
Conducted emission (Location1)	Disturbance voltage (dB $\mu$ V)	$U=4.3$ dB; $k=2$

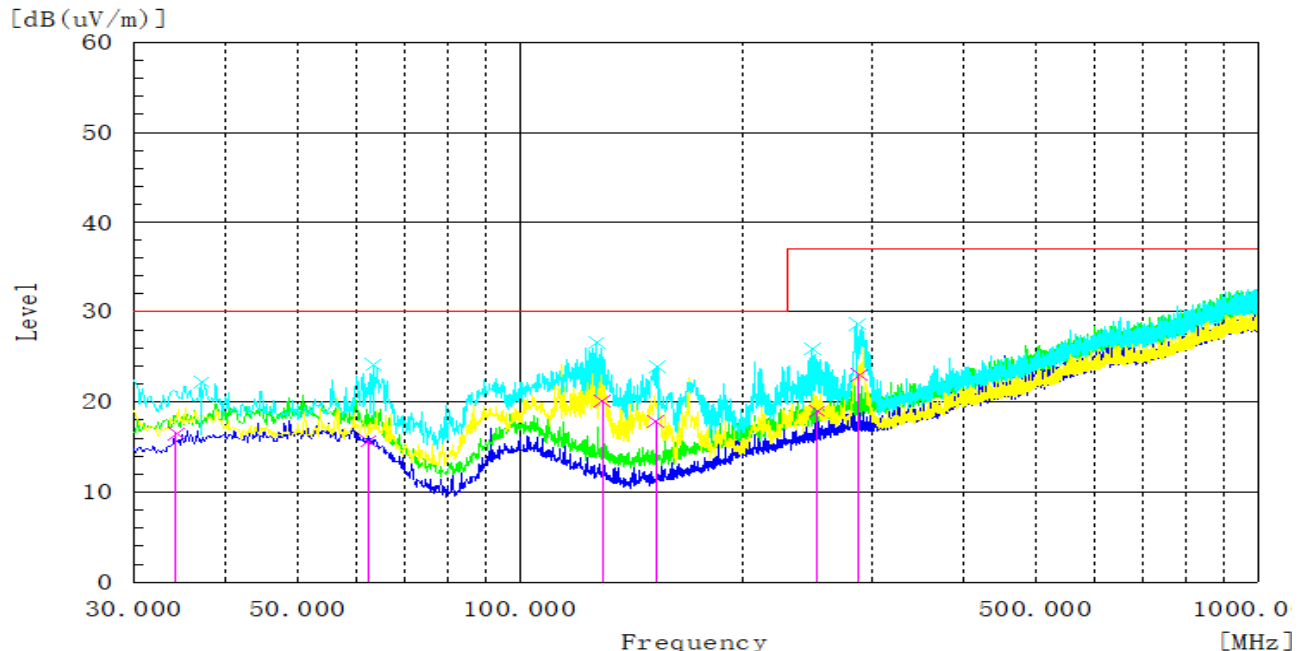


## 11 Graph and Data of Emission Test

### 11.1 Radiated Emission

#### 11.1.1 Radiated Disturbance of TC1 (TM1-TM5), TC2 (TM1-TM5)

30MHz to 1GHz (TC1) :



Measurement Result: QP Detector

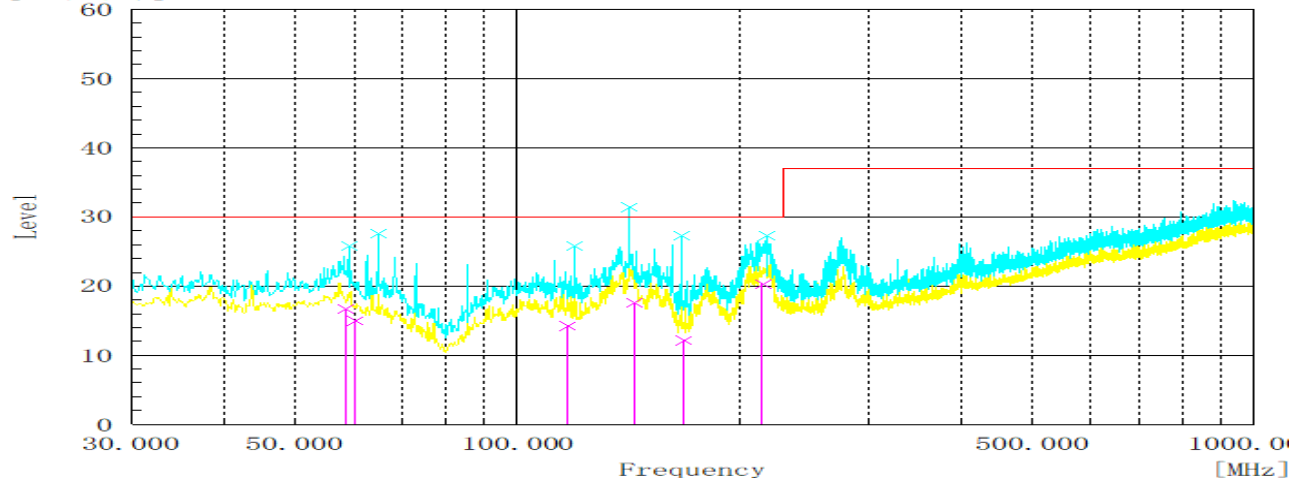
Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
34.233	16.5	-17.0	30.0	13.5	103.0	319.0	Vertical
62.348	15.7	-16.7	30.0	14.3	100.0	327.0	Vertical
129.472	20.1	-20.5	30.0	9.9	100.0	315.0	Vertical
152.893	17.9	-20.6	30.0	12.1	100.0	270.0	Vertical
252.611	19.0	-15.8	37.0	18.0	100.0	98.0	Vertical
288.383	23.1	-14.8	37.0	13.9	101.0	115.0	Vertical

Note:

1. Margin=Limit-Level  
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)  
The reading level is used to calculate by software which is not shown in the sheet.
2. The TC1 with test mode TM1-TM5 has been tested, only the worst data TM1 was shown in the report.

## 30MHz to 1GHz (TC2) :

[dB (μV/m)]



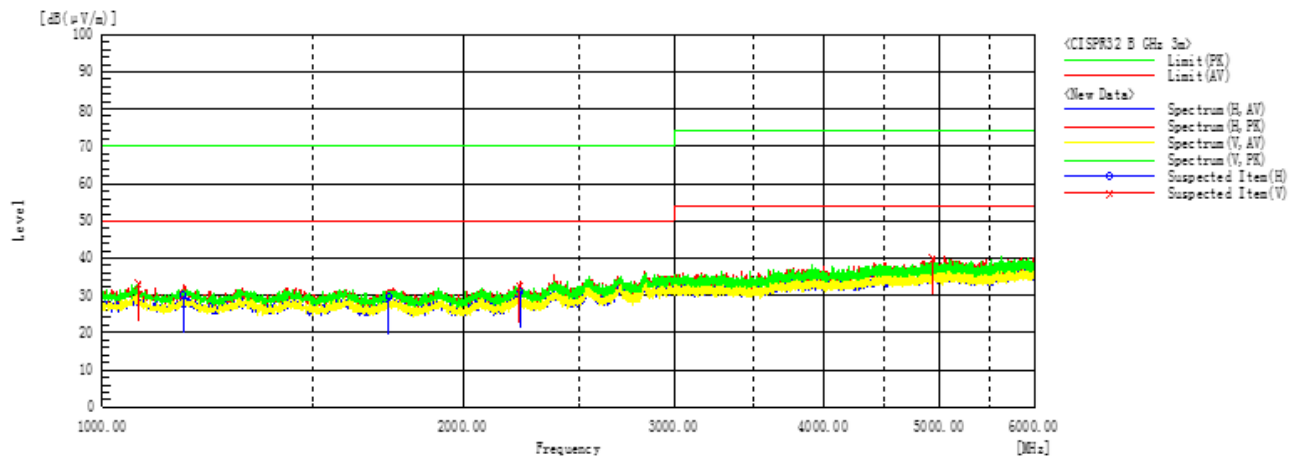
## Measurement Result: QP Detector

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
215.284	20.3	-17.3	30.0	9.7	100.0	223.0	Vertical
144.025	17.6	-20.9	30.0	12.4	108.0	299.0	Vertical
60.293	15.0	-16.4	30.0	15.0	103.0	108.0	Vertical
58.471	16.7	-16.4	30.0	13.3	154.0	228.0	Vertical
168.014	12.2	-19.9	30.0	17.8	101.0	242.0	Vertical
117.238	14.3	-19.0	30.0	15.7	102.0	233.0	Vertical

## Note:

1. Margin=Limit-Level  
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)  
The reading level is used to calculate by software which is not shown in the sheet.
2. The TC2 with test mode TM1-TM5 has been tested, only the worst data TM1 was shown in the report.

## 1GHz to 6GHz (TC1 &amp; TC2) :



## Measurement Result: PK Detector

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
1071.000	33.1	-19.4	70.0	36.9	100	355.0	Vertical
2229.000	32.7	-17.5	70.0	37.3	200	334.0	Vertical
4932.000	39.8	-8.5	74.0	34.2	200	61.0	Vertical

## Measurement Result: AV Detector

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
2233.000	31.0	-17.5	50.0	19.0	200	350	Horizontal
1735.000	29.4	-18.7	50.0	20.6	100	125	Horizontal
1168.500	29.9	-19.3	50.0	20.1	200	317	Horizontal

## Note:

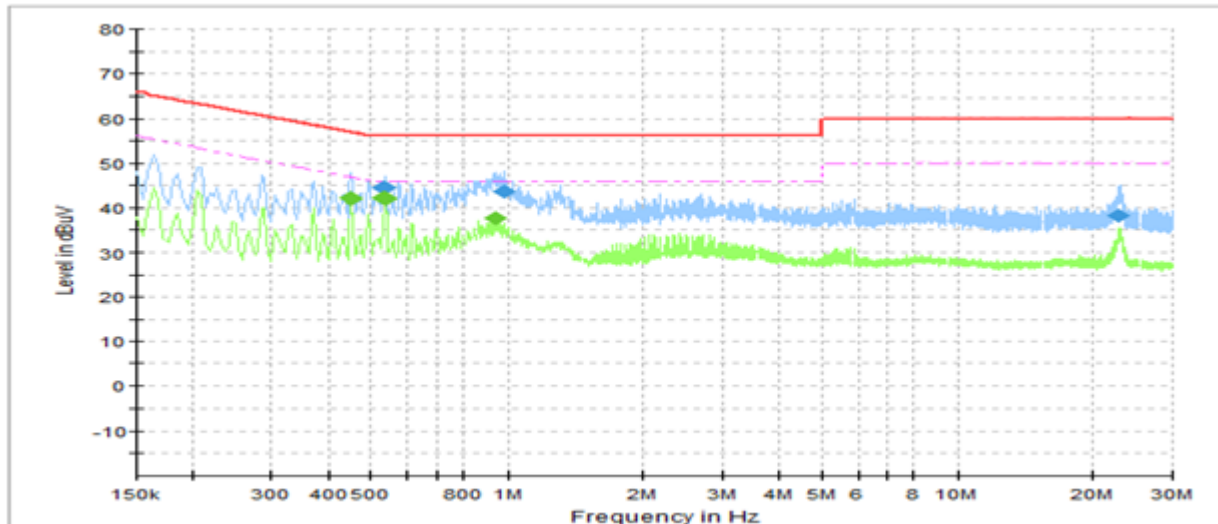
- Margin=Limit-Level  
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)  
The reading level is used to calculate by software which is not shown in the sheet.
- All the test configurations TC1 and TC2 with test mode TM1-TM5 have been tested, only the worst data TC1 (TM1) was shown in the report.

## 11.2 Conducted Disturbance

### 11.2.1 AC output Power Port Test Data for TC1 (TM1-TM5), TC2 (TM1-TM5)

AC output Power Port (TC1):

L1:



Measurement Result: QP Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.532500	44.55	10.3	56.00	11.45	L1	GND
0.982065	43.42	10.4	56.00	12.58	L1	GND
22.962180	38.36	10.6	60.00	21.64	L1	GND

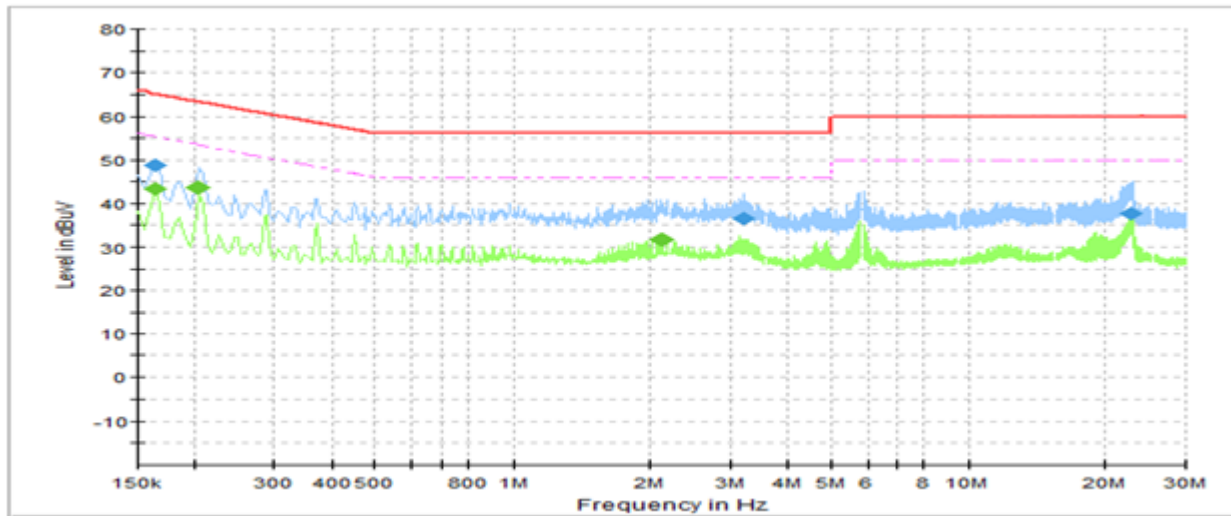
Measurement Result: AV Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.451500	42.20	10.4	46.85	4.65	L1	GND
0.532500	42.11	10.3	46.00	3.89	L1	GND
0.941768	37.71	10.4	46.00	8.29	L1	GND

Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- The TC1 with test mode TM1-TM5 has been tested, only the worst data TM1 was shown in the report.

L2:



Measurement Result: QP Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.163500	48.76	10.6	65.28	16.53	L2	GND
3.220883	36.65	10.3	56.00	19.35	L2	GND
22.948770	37.61	10.6	60.00	22.39	L2	GND

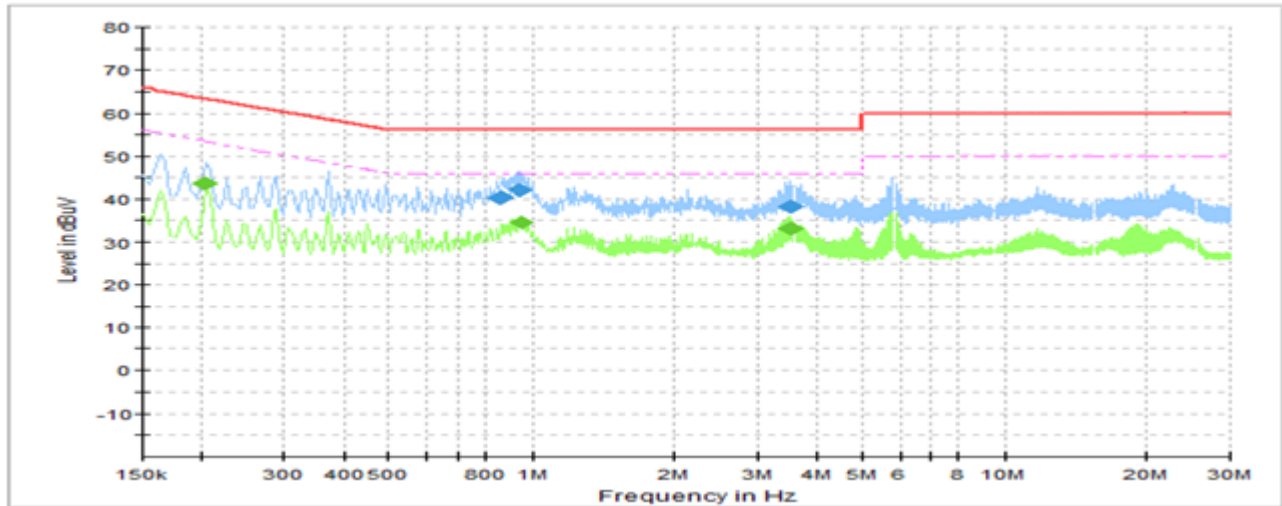
Measurement Result: AV Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.163500	43.18	10.6	55.28	12.11	L2	GND
0.204000	43.63	10.5	53.45	9.81	L2	GND
2.110440	31.66	10.3	46.00	14.34	L2	GND

Note:

1.  $\text{Margin} = \text{Limit} - \text{Level}$   
 $\text{Level} = \text{Reading level} + \text{Transd (cable loss + correction factor)}$   
 The reading level is used to calculate by software which is not shown in the sheet.
2. The TC1 with test mode TM1-TM5 has been tested, only the worst data TM1 was shown in the report.

L3:



## Measurement Result: QP Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.861000	40.48	10.4	56.00	15.52	L3	GND
0.941790	42.12	10.4	56.00	13.88	L3	GND
3.547763	38.17	10.3	56.00	17.83	L3	GND

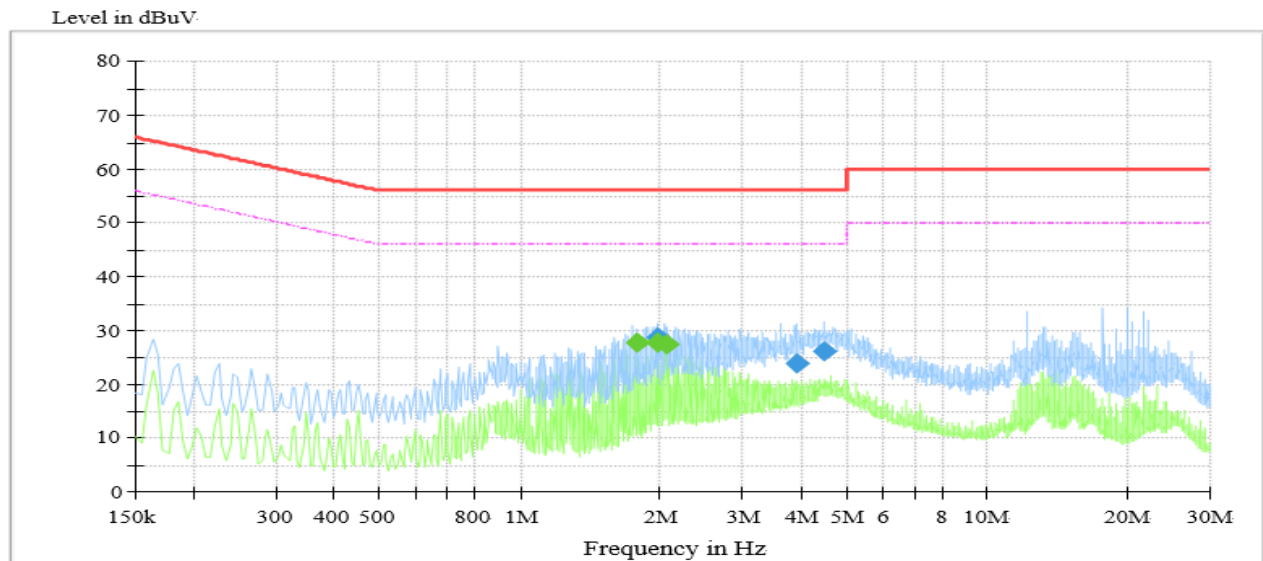
## Measurement Result: AV Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.204000	43.54	10.5	53.45	9.91	L3	GND
0.946290	34.64	10.4	46.00	11.36	L3	GND
3.547763	33.09	10.3	46.00	12.91	L3	GND

## Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- The TC1 with test mode TM1-TM5 has been tested, only the worst data TM1 was shown in the report.

N:



## Measurement Result: QP Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
1.967160	28.81	11.1	56.00	27.19	N	GND
3.932918	23.93	11.2	56.00	32.07	N	GND
4.470038	26.01	11.2	56.00	29.99	N	GND

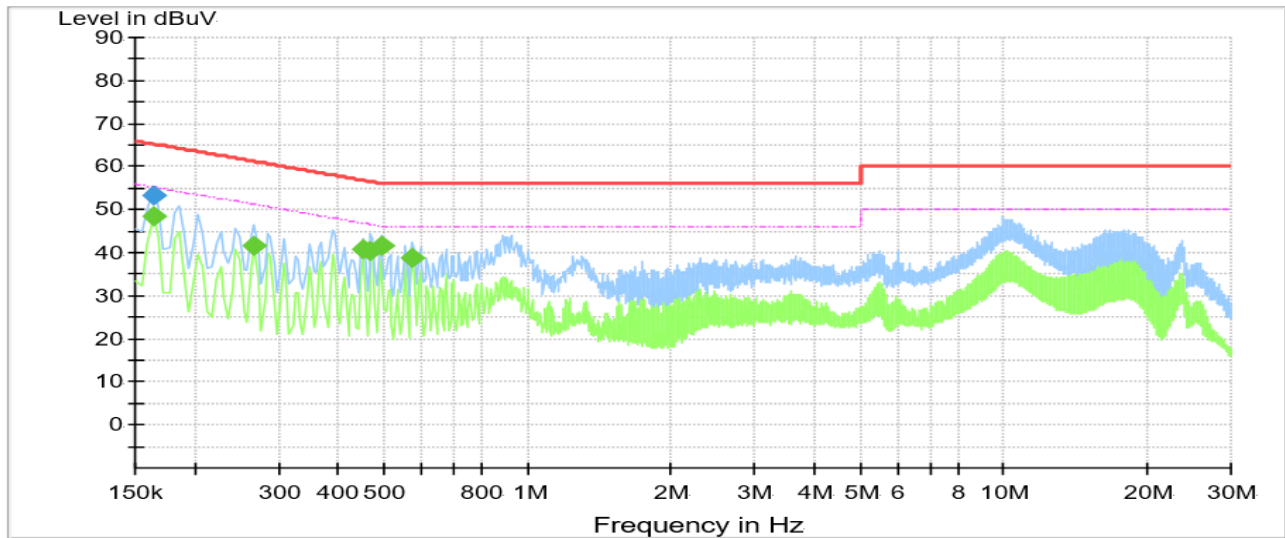
## Measurement Result: AV Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
1.783583	27.72	11.1	46.00	18.28	N	GND
1.967160	27.64	11.1	46.00	18.36	N	GND
2.070143	27.50	11.1	46.00	18.50	N	GND

Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- The TC1 with test mode TM1-TM5 has been tested, only the worst data TM1 was shown in the report.

## AC output Power Port (TC2):



## Measurement Result: QP Detector

Frequency (MHz)	Level (dB $\mu$ V)	Transd (dB)	Limit (dB $\mu$ V)	Margin (dB)	Line	PE
0.163500	53.22	10.5	65.28	12.06	L3	GND

## Measurement Result: AV Detector

Frequency (MHz)	Level (dB $\mu$ V)	Transd (dB)	Limit (dB $\mu$ V)	Margin (dB)	Line	PE
0.163500	48.43	10.5	55.28	6.85	L3	GND
0.267000	41.50	10.3	51.21	9.71	L1	GND
0.451500	40.98	10.2	46.85	5.86	L3	GND
0.469500	40.44	10.2	46.52	6.08	L3	GND
0.492000	41.49	10.2	46.13	4.65	L3	GND
0.573000	38.67	10.2	46.00	7.33	L3	GND

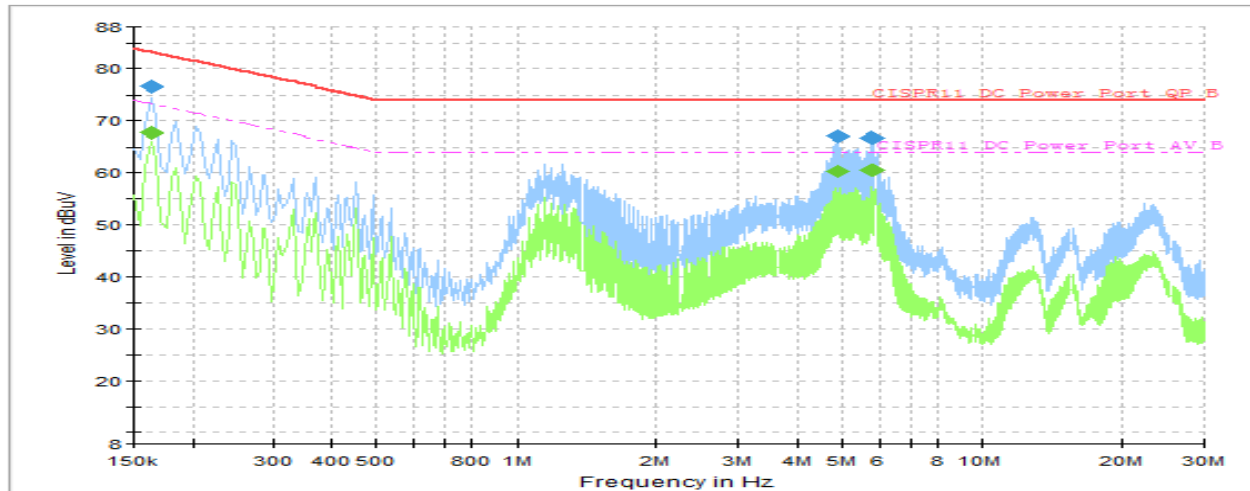
## Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- The TC2 with test mode TM1-TM5 has been tested, only the worst data TM1 was shown in the report.



### 11.2.2 DC input Power Port Test Data for TC1 (TM1-TM5), TC2 (TM1-TM5)

PV- :



Measurement Result: QP Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.163500	76.65	20.1	83.28	6.63	-	GND
4.901990	67.06	19.7	74.00	6.94	-	GND
5.824486	66.66	19.4	74.00	7.34	-	GND

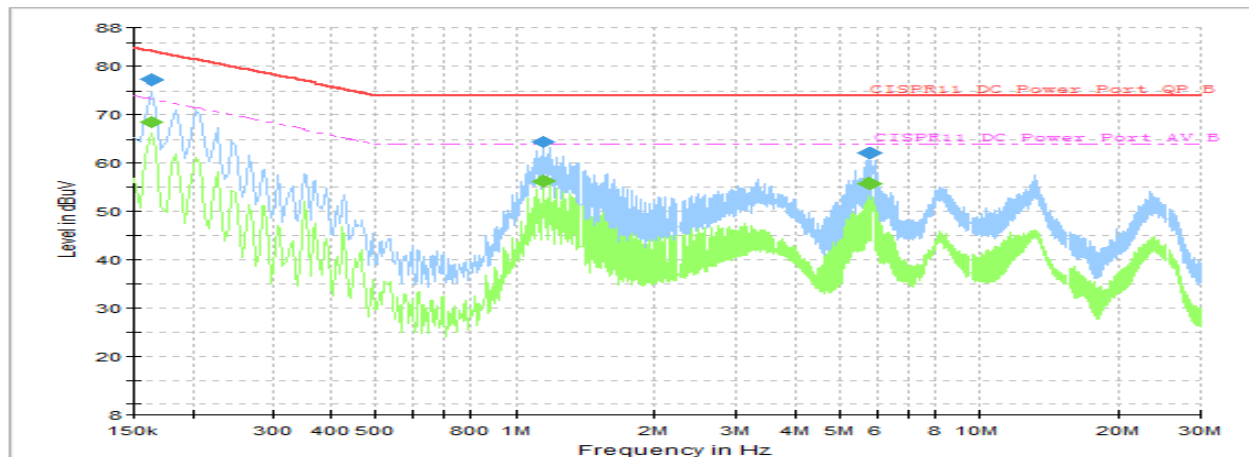
Measurement Result: AV Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.163500	67.80	20.1	73.28	5.49	-	GND
4.901990	60.34	19.7	64.00	3.66	-	GND
5.824486	60.40	19.4	64.00	3.60	-	GND

Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- All the test configurations TC1 and TC2 with test mode TM1-TM5 have been tested, only the worst data TC1 (TM1) was shown in the report.

PV+:



## Measurement Result: QP Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.163500	77.22	20.1	83.28	6.06	+	GND
1.149000	64.36	19.3	74.00	9.64	+	GND
5.824486	62.21	19.4	74.00	11.79	+	GND

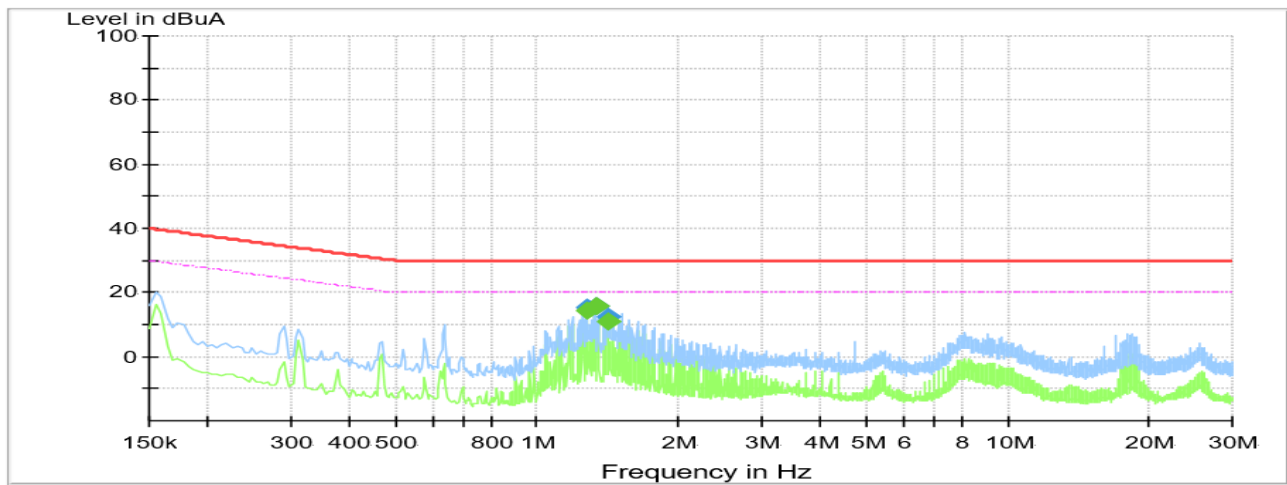
## Measurement Result: AV Detector

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.163500	68.45	20.1	73.28	4.83	+	GND
1.149000	56.19	19.3	64.00	7.81	+	GND
5.824486	55.85	19.4	64.00	8.15	+	GND

## Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- All the test configurations TC1 and TC2 with test mode TM1-TM5 have been tested, only the worst data TC1 (TM1) was shown in the report.

### 11.2.3 485 Port Test Data for TC1 (TM1-TM5), TC2 (TM1-TM5)



#### Measurement Result: QP Detector

Frequency (MHz)	Level (dBμA)	Transd (dB)	Limit (dBμA)	Margin (dB)	Line	PE
1.273148	15.27	-8.4	30.00	14.73	--	--
1.331355	15.96	-8.4	30.00	14.04	--	--
1.417050	12.20	-8.4	30.00	17.80	--	--

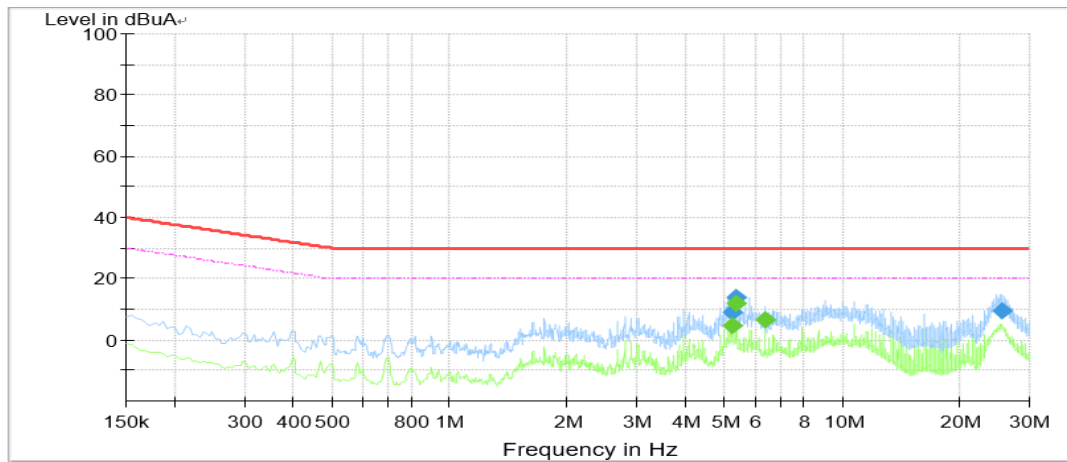
#### Measurement Result: AV Detector

Frequency (MHz)	Level (dBμA)	Transd (dB)	Limit (dBμA)	Margin (dB)	Line	PE
1.273148	14.43	-8.4	20.00	5.57	--	--
1.331355	15.57	-8.4	20.00	4.43	--	--
1.411950	11.14	-8.4	20.00	8.86	--	--

#### Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- All the test configurations TC1 and TC2 with test mode TM1-TM5 have been tested, only the worst data TC2 (TM1) was shown in the report.

### 11.2.4 FE Port Test Data for TC1 (TM4), TC2 (TM4)



#### Measurement Result: QP Detector

Frequency (MHz)	Level (dBμA)	Transd (dB)	Limit (dBμA)	Margin (dB)	Line	PE
5.235825	9.18	-8.5	30.00	20.82	--	--
5.392538	13.75	-8.5	30.00	16.25	--	--
25.573395	9.32	-8.7	30.00	20.68	--	--

#### Measurement Result: AV Detector

Frequency (MHz)	Level (dBμA)	Transd (dB)	Limit (dBμA)	Margin (dB)	Line	PE
5.235825	4.64	-8.5	20.00	15.36	--	--
5.392538	11.81	-8.5	20.00	8.19	--	--
6.373133	6.66	-8.5	20.00	13.34	--	--

#### Note:

- Margin=Limit-Level  
Level= Reading level+ Transd (cable loss + correction factor)  
The reading level is used to calculate by software which is not shown in the sheet.
- All the test configurations TC1 and TC2 with test mode TM4 have been tested, only the worst data TC1 (TM4) was shown in the report.

### 11.3 Current Harmonics

#### 11.3.1 Test Data of Harmonic current of TC1 (≤16A)

Test standard	EN61000-3-2
Voltage/ Frequency	230 V/50 Hz

#### Average harmonic current results:

##### L1:

Hn	Measure[A]	Limit [A]	Margin[%]	Result
1	14.829700	/	/	/
2	0.025098	1.08	97.68%	Pass
3	0.018080	2.30	99.21%	Pass
4	0.029415	430.00E-3	93.16%	Pass
5	0.076100	1.14	93.32%	Pass
6	0.019960	300.00E-3	93.35%	Pass
7	0.074922	770.00E-3	90.27%	Pass
8	0.024437	230.00E-3	89.38%	Pass
9	0.009935	400.00E-3	97.52%	Pass
10	0.028883	184.00E-3	84.30%	Pass
11	0.010652	330.00E-3	96.77%	Pass
12	0.008812	153.33E-3	94.25%	Pass
13	0.044643	210.00E-3	78.74%	Pass
14	0.020432	131.43E-3	84.45%	Pass
15	0.007622	150.00E-3	94.92%	Pass
16	0.023105	115.00E-3	79.91%	Pass
17	0.009703	132.35E-3	92.67%	Pass
18	0.007268	102.22E-3	92.89%	Pass
19	0.021857	118.42E-3	81.54%	Pass
20	0.017090	92.00E-3	81.42%	Pass
21	0.006472	160.71E-3	95.97%	Pass
22	0.016455	83.64E-3	80.33%	Pass
23	0.006897	146.74E-3	95.30%	Pass
24	0.005880	76.66E-3	92.33%	Pass
25	0.010038	135.00E-3	92.56%	Pass
26	0.014057	70.77E-3	80.14%	Pass
27	0.007273	124.99E-3	94.18%	Pass
28	0.011328	65.71E-3	82.76%	Pass
29	0.007102	116.39E-3	93.90%	Pass
30	0.005135	61.33E-3	91.63%	Pass
31	0.015077	108.87E-3	86.15%	Pass
32	0.011283	57.50E-3	80.38%	Pass
33	0.006157	102.27E-3	93.98%	Pass
34	0.008567	54.12E-3	84.17%	Pass
35	0.011527	96.44E-3	88.05%	Pass
36	0.004948	51.11E-3	90.32%	Pass
37	0.025907	91.21E-3	71.60%	Pass
38	0.009942	48.42E-3	79.47%	Pass
39	0.010275	86.53E-3	88.13%	Pass
40	0.008038	46.00E-3	82.53%	Pass

## L2:

Hn	Measure[A]	Limit [A]	Margin[%]	Result
1	14.80854	/	96.50%	/
2	0.037748	1.08	98.60%	Pass
3	0.032155	2.30	93.09%	Pass
4	0.029712	430.00E-3	92.98%	Pass
5	0.079998	1.14	92.92%	Pass
6	0.021247	300.00E-3	90.33%	Pass
7	0.074457	770.00E-3	89.09%	Pass
8	0.025083	230.00E-3	96.90%	Pass
9	0.012397	400.00E-3	84.86%	Pass
10	0.02785	184.00E-3	96.48%	Pass
11	0.01162	330.00E-3	93.75%	Pass
12	0.009583	153.33E-3	79.86%	Pass
13	0.042293	210.00E-3	84.12%	Pass
14	0.020872	131.43E-3	90.11%	Pass
15	0.014835	150.00E-3	80.56%	Pass
16	0.022355	115.00E-3	91.14%	Pass
17	0.01172	132.35E-3	92.16%	Pass
18	0.008013	102.22E-3	84.51%	Pass
19	0.018345	118.42E-3	81.86%	Pass
20	0.016688	92.00E-3	94.06%	Pass
21	0.009545	160.71E-3	80.74%	Pass
22	0.016107	83.64E-3	93.26%	Pass
23	0.009892	146.74E-3	87.73%	Pass
24	0.00941	76.66E-3	91.56%	Pass
25	0.01139	135.00E-3	81.45%	Pass
26	0.013128	70.77E-3	86.03%	Pass
27	0.017467	124.99E-3	82.52%	Pass
28	0.011483	65.71E-3	94.34%	Pass
29	0.006592	116.39E-3	90.03%	Pass
30	0.006113	61.33E-3	88.81%	Pass
31	0.012183	108.87E-3	81.28%	Pass
32	0.010763	57.50E-3	94.11%	Pass
33	0.006028	102.27E-3	84.15%	Pass
34	0.008578	54.12E-3	82.75%	Pass
35	0.016632	96.44E-3	88.47%	Pass
36	0.005892	51.11E-3	58.70%	Pass
37	0.037667	91.21E-3	78.61%	Pass
38	0.010357	48.42E-3	81.62%	Pass
39	0.015905	86.53E-3	83.28%	Pass
40	0.007692	46.00E-3	96.50%	Pass

## L3:

Hn	Measure[A]	Limit [A]	Margin[%]	Result
1	14.77716	/	97.09%	/
2	0.031452	1.08	99.19%	Pass
3	0.018667	2.30	93.19%	Pass
4	0.029285	430.00E-3	92.44%	Pass
5	0.086172	1.14	93.59%	Pass
6	0.019245	300.00E-3	90.12%	Pass
7	0.076083	770.00E-3	89.43%	Pass

8	0.024303	230.00E-3	96.03%	Pass
9	0.015883	400.00E-3	84.20%	Pass
10	0.029078	184.00E-3	96.73%	Pass
11	0.010797	330.00E-3	93.54%	Pass
12	0.009912	153.33E-3	81.24%	Pass
13	0.039398	210.00E-3	83.90%	Pass
14	0.021163	131.43E-3	91.86%	Pass
15	0.012212	150.00E-3	80.00%	Pass
16	0.023005	115.00E-3	89.11%	Pass
17	0.014408	132.35E-3	91.91%	Pass
18	0.008272	102.22E-3	82.18%	Pass
19	0.0211	118.42E-3	80.43%	Pass
20	0.018007	92.00E-3	94.49%	Pass
21	0.008848	160.71E-3	79.87%	Pass
22	0.01684	83.64E-3	92.16%	Pass
23	0.0115	146.74E-3	88.23%	Pass
24	0.009027	76.66E-3	92.47%	Pass
25	0.010172	135.00E-3	79.95%	Pass
26	0.014188	70.77E-3	89.09%	Pass
27	0.013642	124.99E-3	82.18%	Pass
28	0.01171	65.71E-3	92.64%	Pass
29	0.008565	116.39E-3	90.42%	Pass
30	0.005875	61.33E-3	88.57%	Pass
31	0.012445	108.87E-3	80.56%	Pass
32	0.011178	57.50E-3	94.18%	Pass
33	0.005953	102.27E-3	84.04%	Pass
34	0.008635	54.12E-3	90.15%	Pass
35	0.0095	96.44E-3	89.47%	Pass
36	0.005383	51.11E-3	77.31%	Pass
37	0.020693	91.21E-3	79.61%	Pass
38	0.009873	48.42E-3	90.08%	Pass
39	0.008582	86.53E-3	82.68%	Pass
40	0.007967	46.00E-3	97.09%	Pass

## Maximum harmonic current results:

### L1:

Hn	Measure[A]	Limit [A]	Margin[%]	Result
1	14.841	/	97.96%	/
2	0.033	1.62	99.33%	Pass
3	0.023	3.45	94.42%	Pass
4	0.036	645.00E-3	95.15%	Pass
5	0.083	1.71	93.78%	Pass
6	0.028	450.00E-3	92.87%	Pass
7	0.082	1.15	90.72%	Pass
8	0.032	345.00E-3	97.83%	Pass
9	0.013	600.00E-3	87.68%	Pass
10	0.034	276.00E-3	96.97%	Pass
11	0.015	495.00E-3	94.35%	Pass
12	0.013	229.99E-3	84.44%	Pass
13	0.049	315.00E-3	86.30%	Pass
14	0.027	197.15E-3	95.11%	Pass
15	0.011	225.00E-3	83.77%	Pass
16	0.028	172.50E-3	93.45%	Pass

17	0.013	198.52E-3	92.83%	Pass
18	0.011	153.33E-3	84.80%	Pass
19	0.027	177.63E-3	84.78%	Pass
20	0.021	138.00E-3	92.53%	Pass
21	0.012	160.71E-3	82.46%	Pass
22	0.022	125.46E-3	93.19%	Pass
23	0.01	146.74E-3	91.30%	Pass
24	0.01	114.99E-3	88.89%	Pass
25	0.015	135.00E-3	83.04%	Pass
26	0.018	106.16E-3	90.40%	Pass
27	0.012	124.99E-3	84.78%	Pass
28	0.015	98.57E-3	91.41%	Pass
29	0.01	116.39E-3	90.22%	Pass
30	0.009	92.00E-3	82.55%	Pass
31	0.019	108.87E-3	82.61%	Pass
32	0.015	86.25E-3	91.20%	Pass
33	0.009	102.27E-3	83.99%	Pass
34	0.013	81.18E-3	82.37%	Pass
35	0.017	96.44E-3	86.96%	Pass
36	0.01	76.66E-3	57.24%	Pass
37	0.039	91.21E-3	82.10%	Pass
38	0.013	72.63E-3	82.66%	Pass
39	0.015	86.53E-3	82.61%	Pass
40	0.012	69.00E-3	97.96%	Pass

## L2:

Hn	Measure[A]	Limit [A]	Margin[%]	Result
1	14.819	/	/	/
2	0.044	1.62	97.28%	Pass
3	0.039	3.45	98.87%	Pass
4	0.04	645.00E-3	93.80%	Pass
5	0.086	1.71	94.97%	Pass
6	0.03	450.00E-3	93.33%	Pass
7	0.082	1.15	92.87%	Pass
8	0.03	345.00E-3	91.30%	Pass
9	0.016	600.00E-3	97.33%	Pass
10	0.034	276.00E-3	87.68%	Pass
11	0.017	495.00E-3	96.57%	Pass
12	0.019	229.99E-3	91.74%	Pass
13	0.047	315.00E-3	85.08%	Pass
14	0.026	197.15E-3	86.81%	Pass
15	0.021	225.00E-3	90.67%	Pass
16	0.029	172.50E-3	83.19%	Pass
17	0.019	198.52E-3	90.43%	Pass
18	0.015	153.33E-3	90.22%	Pass
19	0.024	177.63E-3	86.49%	Pass
20	0.021	138.00E-3	84.78%	Pass
21	0.015	160.71E-3	90.67%	Pass
22	0.019	125.46E-3	84.86%	Pass
23	0.014	146.74E-3	90.46%	Pass
24	0.016	114.99E-3	86.09%	Pass
25	0.015	135.00E-3	88.89%	Pass
26	0.019	106.16E-3	82.10%	Pass
27	0.023	124.99E-3	81.60%	Pass



28	0.014	98.57E-3	85.80%	Pass
29	0.01	116.39E-3	91.41%	Pass
30	0.011	92.00E-3	88.04%	Pass
31	0.015	108.87E-3	86.22%	Pass
32	0.015	86.25E-3	82.61%	Pass
33	0.009	102.27E-3	91.20%	Pass
34	0.012	81.18E-3	85.22%	Pass
35	0.022	96.44E-3	77.19%	Pass
36	0.01	76.66E-3	86.96%	Pass
37	0.047	91.21E-3	48.47%	Pass
38	0.015	72.63E-3	79.35%	Pass
39	0.019	86.53E-3	78.04%	Pass
40	0.011	69.00E-3	84.06%	Pass

## L3:

Hn	Measure[A]	Limit [A]	Margin[%]	Result
1	14.788	/	/	/
2	0.038	1.62	97.65%	Pass
3	0.026	3.45	99.25%	Pass
4	0.039	645.00E-3	93.95%	Pass
5	0.095	1.71	94.44%	Pass
6	0.028	450.00E-3	93.78%	Pass
7	0.084	1.15	92.70%	Pass
8	0.031	345.00E-3	91.01%	Pass
9	0.02	600.00E-3	96.67%	Pass
10	0.035	276.00E-3	87.32%	Pass
11	0.015	495.00E-3	96.97%	Pass
12	0.021	229.99E-3	90.87%	Pass
13	0.045	315.00E-3	85.71%	Pass
14	0.025	197.15E-3	87.32%	Pass
15	0.021	225.00E-3	90.67%	Pass
16	0.03	172.50E-3	82.61%	Pass
17	0.021	198.52E-3	89.42%	Pass
18	0.015	153.33E-3	90.22%	Pass
19	0.026	177.63E-3	85.36%	Pass
20	0.022	138.00E-3	84.06%	Pass
21	0.015	160.71E-3	90.67%	Pass
22	0.02	125.46E-3	84.06%	Pass
23	0.016	146.74E-3	89.10%	Pass
24	0.019	114.99E-3	83.48%	Pass
25	0.015	135.00E-3	88.89%	Pass
26	0.018	106.16E-3	83.04%	Pass
27	0.018	124.99E-3	85.60%	Pass
28	0.015	98.57E-3	84.78%	Pass
29	0.012	116.39E-3	89.69%	Pass
30	0.013	92.00E-3	85.87%	Pass
31	0.015	108.87E-3	86.22%	Pass
32	0.015	86.25E-3	82.61%	Pass
33	0.01	102.27E-3	90.22%	Pass
34	0.012	81.18E-3	85.22%	Pass
35	0.017	96.44E-3	82.37%	Pass
36	0.013	76.66E-3	83.04%	Pass
37	0.03	91.21E-3	67.11%	Pass
38	0.014	72.63E-3	80.72%	Pass

39	0.014	86.53E-3	83.82%	Pass
40	0.011	69.00E-3	84.06%	Pass

## Note:

1. To cover the requirements of two harmonic standards greater than 16A and no more than 16A, the test was done at power 20kW and 10kW respectively, this data is no more than 16A harmonic current data.
2. The test model SUN2000-10KTL-M0 and SUN2000-10KTL-M2 have been tested, only the worst data SUN2000-10KTL-M0 (TM1) was shown in the report.

**11.3.2 Test Data of Harmonic current of TC1(>16A)**

Test standard	EN61000-3-12
Voltage/ Frequency(rms)	230 V/50 Hz
Current(rms)	22 A

**Average harmonic current results:****L1:**

Hn	Measure[%]	Limit [%]	Margin[%]	Result
2	0.2795	8.0000	96.51	Pass
3	0.0983	21.6000	99.54	Pass
4	0.0357	4.0000	99.11	Pass
5	0.5828	10.7000	94.55	Pass
6	0.0745	2.6667	97.21	Pass
7	0.2329	7.2000	96.77	Pass
8	0.0355	2.0000	98.23	Pass
9	0.0669	3.8000	98.24	Pass
10	0.0368	1.6000	97.70	Pass
11	0.1325	3.1000	95.73	Pass
12	0.0524	1.3333	96.07	Pass
13	0.1085	2.0000	94.58	Pass
THD	0.0983	23.0000	99.57	Pass
PWH	0.0000	23.0000	100	Pass

**L2:**

Hn	Measure[%]	Limit [%]	Margin[%]	Result
2	0.3124	8.0000	96.10	Pass
3	0.1480	21.6000	99.31	Pass
4	0.0773	4.0000	98.07	Pass
5	0.6507	10.7000	93.92	Pass
6	0.0637	2.6667	97.61	Pass
7	0.2922	7.2000	95.94	Pass
8	0.0539	2.0000	97.31	Pass
9	0.0837	3.8000	97.80	Pass
10	0.0419	1.6000	97.38	Pass
11	0.0796	3.1000	97.43	Pass
12	0.0553	1.3333	95.85	Pass
13	0.1119	2.0000	94.41	Pass
THD	0.1480	23.0000	99.36	Pass
PWH	0.0000	23.0000	100	Pass

**L3:**

Hn	Measure[%]	Limit [%]	Margin[%]	Result
2	0.3020	8.0000	96.23	Pass
3	0.2183	21.6000	98.99	Pass
4	0.0690	4.0000	98.28	Pass
5	0.6160	10.7000	94.24	Pass
6	0.0616	2.6667	97.69	Pass

7	0.2546	7.2000	96.46	Pass
8	0.0484	2.0000	97.58	Pass
9	0.0767	3.8000	97.98	Pass
10	0.0484	1.6000	96.98	Pass
11	0.0855	3.1000	97.24	Pass
12	0.0503	1.3333	96.23	Pass
13	0.0712	2.0000	96.44	Pass
THD	0.2183	23.0000	99.05	Pass
PWH	0.0000	23.0000	100	Pass

## Maximum harmonic current results:

### L1:

Hn	Measure[%]	Limit [%]	Margin[%]	Result
2	0.3867	12.0000	96.78	Pass
3	0.2555	32.4000	99.21	Pass
4	0.1001	6.0000	98.33	Pass
5	0.6905	16.0500	95.70	Pass
6	0.2175	4.0000	94.56	Pass
7	0.3314	10.8000	96.93	Pass
8	0.1139	3.0000	96.20	Pass
9	0.2106	5.7000	96.31	Pass
10	0.1450	2.4000	93.96	Pass
11	0.1968	4.6500	95.77	Pass
12	0.1415	2.0000	92.92	Pass
13	0.1968	3.0000	93.44	Pass
THD	0.2555	34.5000	99.26	Pass
PWH	0.0000	34.5000	100	Pass

### L2:

Hn	Measure[%]	Limit [%]	Margin[%]	Result
2	0.4138	12.0000	96.55	Pass
3	0.3103	32.4000	99.04	Pass
4	0.1724	6.0000	97.13	Pass
5	0.7586	16.0500	95.27	Pass
6	0.1724	4.0000	95.69	Pass
7	0.4138	10.8000	96.17	Pass
8	0.1724	3.0000	94.25	Pass
9	0.2069	5.7000	96.37	Pass
10	0.1379	2.4000	94.25	Pass
11	0.1724	4.6500	96.29	Pass
12	0.1379	2.0000	93.10	Pass
13	0.2069	3.0000	93.10	Pass
THD	0.3103	34.5000	99.10	Pass
PWH	0.0000	34.5000	100	Pass

### L3:

Hn	Measure[%]	Limit [%]	Margin[%]	Result
2	0.4170	12.0000	96.53	Pass
3	0.4170	32.4000	98.71	Pass
4	0.1737	6.0000	97.10	Pass

5	0.7297	16.0500	95.45	Pass
6	0.1737	4.0000	95.66	Pass
7	0.3475	10.8000	96.78	Pass
8	0.1390	3.0000	95.37	Pass
9	0.2085	5.7000	96.34	Pass
10	0.1390	2.4000	94.21	Pass
11	0.2085	4.6500	95.52	Pass
12	0.1390	2.0000	93.05	Pass
13	0.1737	3.0000	94.21	Pass
THD	0.4170	34.5000	98.79	Pass
PWH	0.0000	34.5000	100	Pass

## Note:

1. To cover the requirements of two harmonic standards greater than 16A and no more than 16A, the test was done at power 20kW and 10kW respectively, this data is greater than 16A harmonic current data.
2. All the test configurations TC1 and TC2 with test mode TM1-TM5 have been tested, only the worst data TC1 (TM1) was shown in the report.

## 11.4 Voltage Fluctuation and Flicker

### 11.4.1 Test Data of Voltage Fluctuation and Flicker( $\leq 16A$ )

Test standard	EN61000-3-3
Voltage/ Frequency	230 V/50 Hz
Short time (Pst)	10 min
Observation time	120 min (12 Flicker measurements)

#### Maximum Flicker Results

##### L1:

	EUT values	Limit	Result
Pst	0.10	1.00	Pass
Plt	0.08	0.65	Pass
dc [%]	0.23	3.30	Pass
dmax [%]	0.29	4.00	Pass
dt [s]	0.00	0.50	Pass

##### L2:

	EUT values	Limit	Result
Pst	0.08	1.00	Pass
Plt	0.08	0.65	Pass
dc [%]	0.31	3.30	Pass
dmax [%]	0.34	4.00	Pass
dt [s]	0.00	0.50	Pass

##### L3:

	EUT values	Limit	Result
Pst	0.08	1.00	Pass
Plt	0.08	0.65	Pass
dc [%]	0.32	3.30	Pass
dmax [%]	0.34	4.00	Pass
dt [s]	0.00	0.50	Pass

#### Note:

1. To cover the requirements of two flicker standards greater than 16A and no more than 16A, the test was done at power 20kW and 10kW respectively, this data is no more than 16A flicker data.
2. The test model SUN2000-10KTL-M0 and SUN2000-10KTL-M2 have been tested, only the worst data SUN2000-10KTL-M0 (TM1) was shown in the report.

**11.4.2 Test Data of Voltage Fluctuation and Flicker (>16A)**

Test standard	EN61000-3-11
Voltage/ Frequency	230 V/50 Hz
Short time (Pst)	10 min
Observation time	120 min (12 Flicker measurements)

**Maximum Flicker Results****L1:**

	EUT values	Limit	Result
Pst	0.39	1.00	Pass
Plt	0.31	0.65	Pass
dc [%]	0.38	3.30	Pass
dmax [%]	0.51	4.00	Pass
dt [s]	0.00	0.50	Pass

**L2:**

	EUT values	Limit	Result
Pst	0.50	1.00	Pass
Plt	0.35	0.65	Pass
dc [%]	0.38	3.30	Pass
dmax [%]	0.50	4.00	Pass
dt [s]	0.00	0.50	Pass

**L3:**

	EUT values	Limit	Result
Pst	0.31	1.00	Pass
Plt	0.18	0.65	Pass
dc [%]	0.37	3.30	Pass
dmax [%]	0.51	4.00	Pass
dt [s]	0.00	0.50	Pass

**Note:**

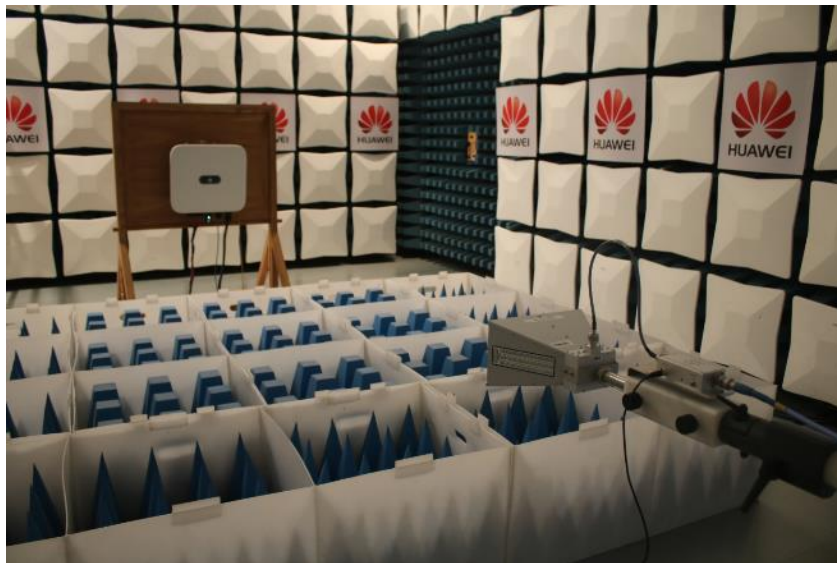
1. To cover the requirements of two flicker standards greater than 16A and no more than 16A, the test was done at power 20kW and 10kW respectively, this data is greater than 16A flicker data.
2. All the test configurations TC1 and TC2 with test mode TM1-TM5 have been tested, only the worst data TC1 (TM1) was shown in the report.

## 12 Photographs of Test Set-up

### 12.1 Emissions



Radiated emission for 30 MHz to 1 GHz



Radiated emission for 1 GHz to 6 GHz





Conducted emissions of AC output Power Port



Conducted emissions of DC input Power Port



Conducted emissions of signal port

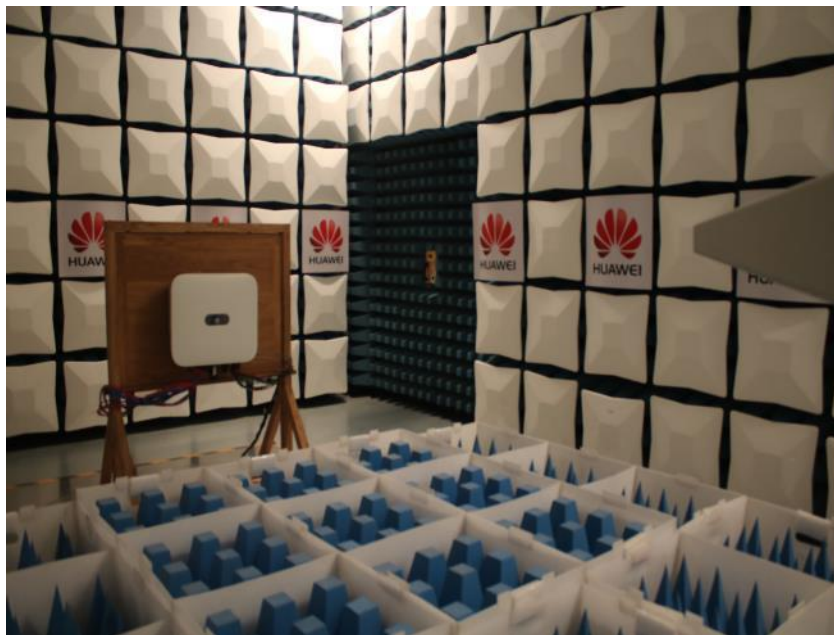


Current harmonics and voltage fluctuations (flicker)

## 12.2 Immunity



Immunity to radiated electric fields for 80 MHz to 1000 MHz



Immunity to radiated electric fields for 1000 MHz to 6000 MHz

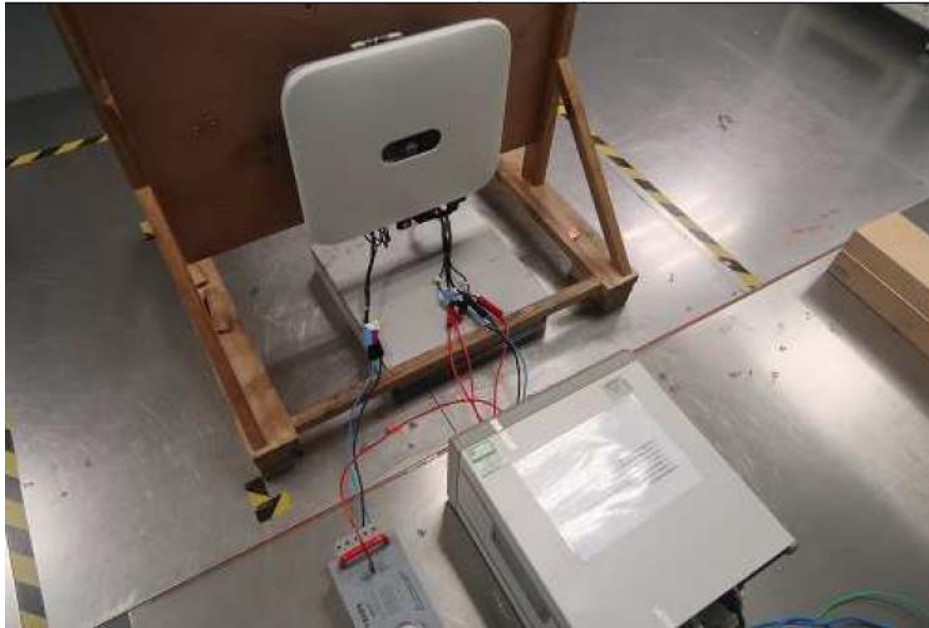


Electrostatic discharge



Immunity to electrical fast transient bursts of AC output Power Port





Immunity to electrical fast transient bursts of DC input Power Port



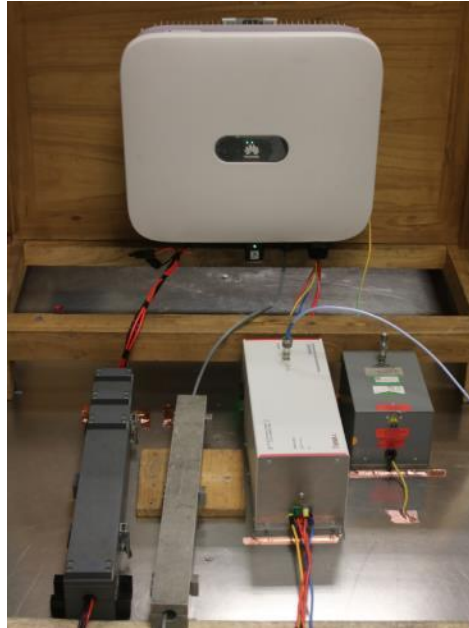
Immunity to electrical fast transient bursts of signal port



Immunity to surges of DC input & AC output Power Port



Immunity to surges of signal port



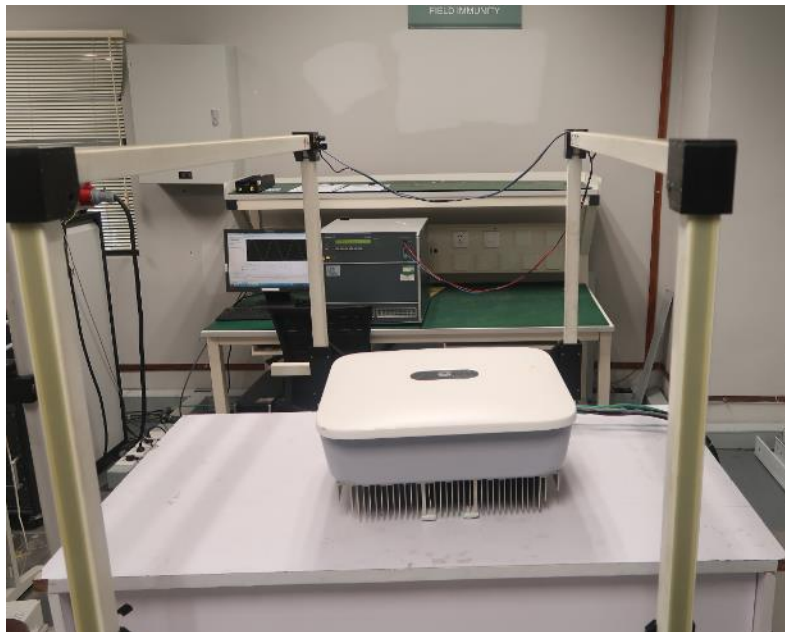
Immunity to continuous conducted interference of AC output Power Port



Immunity to continuous conducted interference of DC input Power Port



Immunity to continuous conducted interference of signal port



Immunity to power frequency magnetic field



**Appendix: Abbreviation**

Table 28 Abbreviation

Abbreviation	Full Name
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMS	Electromagnetic Susceptibility
ESD	Electrostatic Discharge
EUT	Equipment Under Test
AE	Auxiliary Equipment
AC	Alternating Current
DC	Direct Current
NSA	Normalized Site Attenuation
$S_{VSWR}$	Site Voltage Standing Wave Ratio
LISN	Line Impedance Stabilization Network
ISN	Impedance Stabilization Network
CDN	Coupling and Decoupling Network
TC	Test Configuration
NT	Not Test
N/A	Not Applicable
RMS	Root Mean Square

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**END**