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 Smart Monitor & Data Logger
Brand Name	Huawei
Model	SmartLogger3000B02EU
Additional Model & Model Difference	SmartLogger3000A00GL, See Item 2.1
Date of tests	Oct. 17, 2019 ~ Oct. 24, 2019

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

- ☒ **EN 55032:2015**
- ☒ **EN 55011:2016 + A1:2017 (Group 1)**
- ☒ **AS/NZS CISPR 32:2015**
- ☒ **EN 61000-3-2:2014**
- ☒ **EN 61000-3-3:2013**
- ☒ **EN 55035:2017**
- ☒ **EN 55024:2010+A1:2015**
- ☒ **Final draft EN 301 489-1 V2.2.2 (2019-09)**
- ☒ **CISPR 32:2015**
- ☒ **CISPR 11:2016 + A1:2017 (Group 1)**
- ☒ **AS CISPR 11:2017 (Group 1)**
- ☒ **IEC 61000-3-2:2014**
- ☒ **IEC 61000-3-3:2013**
- ☒ **CISPR 35:2016**
- ☒ **CISPR 24:2010+A1:2015**
- ☒ **Draft EN 301 489-17 V3.2.0 (2017-03)**

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

Tested by Andy Zhu Project Engineer / EMC Department	Approved by Madison Luo Assistant Manager / EMC Department
Andy	Date: Nov. 11, 2019

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RELEASE CONTROL RECORD

Issue No.	Description	Date Issued
CE191017N023-1	Original release	Nov. 06, 2019
CE191017N023-2	Based on the original report CE191017N023-1 changed model number, but it doesn't need to be retest after engineer evaluated.	Nov. 11, 2019

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	Test Item	Result	Remark
EN 55032:2015 CISPR 32:2015 EN 55011:2016 + A1:2017 (Group 1)* CISPR11:2015 + A1:2016 (Group 1)* AS/NZS CISPR 32: 2015 AS CISPR 11:2017*	Conducted emission from the AC mains power port	PASS	Minimum passing margin is 18.14dB at 0.343500MHz
	Conducted emission from the MBUS port	PASS	Minimum passing margin is 4.36dB at 4.691340MHz
	Conducted Test (Telecom port)	PASS	Minimum passing margin is 4.56dB at 0.577500MHz
	Radiated emission 30MHz-1000MHz	PASS	Minimum passing margin is 6.60dB at 625.019MHz
	Radiated emission 1GHz -6GHz	PASS	Minimum passing margin is 15.8dB at 1250.00000MHz.
	Conducted emission from the DC power port	N/A	Without GCPC equipment and DC power cable is less than or equal to 3m in length.
EN 61000-3-2:2014 IEC 61000-3-2:2014	Harmonic current emissions	PASS	Meets the requirements.
EN 61000-3-3:2013 IEC 61000-3-3:2013	Voltage fluctuations & flicker	PASS	Meets the requirements.

Note: 1. EN55032:2015 version is required by client and it will also remark in report that it comply with previous standard EN 55032:2012 + AC:2013.

*The MBUS communication mode only apply to this standard class A limit.

IMMUNITY (EN 55024:2010+A1:2015, CISPR 24:2010+A1:2015)			
Standard	**Test Type**	**Result**	**Remarks**
IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-3:2010 ED. 3.2	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4:2012 ED. 3.0	Electrical fast transient / burst immunity test.	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-5:2017 ED. 3.1	Surge immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-6:2013 ED. 4.0	Immunity to conducted disturbances, induced by radio-frequency fields	PASS	Meets the requirements of Performance Criterion A
IEC61000-4-11:2017 ED. 2.1	Voltage dips, short interruptions and voltage variations immunity tests	PASS	Meets the requirements of Voltage Dips: i) >95% residual - Performance Criterion A ii) 30% residual – Performance Criterion A iii) >95% residual – Performance Criterion B

Note: EN 55024:2010+A1:2015 versions is required by client and it will also remark in report
that it comply with previous standard EN 55024:2010

IMMUNITY (EN 55035:2017, CISPR 35:2016)			
Standard	**Test Type**	**Result**	**Remark**
IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-3:2010 ED. 3.2	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4:2012 ED. 3.0	Electrical fast transient / burst immunity test.	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-5:2017 ED. 3.1	Surge immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-6:2013 ED. 4.0	Immunity to conducted disturbances, induced by radio-frequency fields	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11:2017 ED. 2.1	Voltage dips, short interruptions and voltage variations immunity tests	PASS	Meets the requirements of Voltage Dips: i) >95% residual - Performance Criterion A ii) 30% residual – Performance Criterion A iii) >95% residual – Performance Criterion C

IMMUNITY (Final draft EN 301 489-1 V2.2.2, Draft EN 301489-17 V3.2.0,)			
Standard	**Test Type**	**Result**	**Remark**
EN 61000-4-2:2009	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-3:2006 A1:2008 + A2:2010	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-4:2012	Electrical fast transient / burst immunity test.	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-5:2014 + A1:2017	Surge immunity test	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-6:2014	Immunity to conducted disturbances, induced by radio-frequency fields	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-11:2004 + A1:2017	Voltage dips, short interruptions and voltage variations immunity tests	PASS	Voltage Dips: i) 0% residual for 0.5 cycle, Performance Criterion A ii) 0% residual for 1 cycle, Performance Criterion A iii) 70% residual for 25 cycle, Performance Criterion A Voltage Interruptions: iv) 0% residual for 250 cycle, Performance Criterion C

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:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions at AC Main Port (Shanghai Huawei)	0.15MHz ~ 30MHz	+ /-2.20 dB
Conducted Test at Telecom port (Shanghai Huawei)	0.15MHz ~ 30MHz (Disturbance voltage)	+ /-3.50 dB
	0.15MHz ~ 30MHz (Disturbance current)	+ /-2.10 dB
Radiated emissions(Shanghai Huawei)	30MHz ~ 1000MHz	+ /-5.60 dB
Radiated emissions(Shanghai Huawei)	1GHz ~ 6GHz	+ /-5.60 dB

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Solar Smart Monitor & Data Logger	
TEST MODEL	SmartLogger3000B02EU	
ADDITIONAL MODEL	SmartLogger3000A00GL	
POWER SUPPLY	DC 12V From Adapter Input AC 100-240V 50/60Hz or DC 24V From DC Source	
CABLE SUPPLIED	N/A	
OPERATING FREQUENCY	WIFI	2412-2472MHz for 11b/g/n(HT20)

Note:

1. For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.
2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
3. This report is issued based on the previous report with report number CE191017N023-1, the model SmartLogger3000B02EU is the same as the test model SmartLogger3000A03EU except the model number and function for marketing purpose. The model SmartLogger3000A03EU with GSM, WCDMA and LTE communication, model SmartLogger3000B02EU without GSM, WCDMA and LTE communication.
4. Additional model SmartLogger3000A00GL is identical with the test model SmartLogger3000B02EU except model number and function and Exporting country for marketing purpose. The model SmartLogger3000B02EU with MBUS communication, model SmartLogger3000A00GL without MBUS communication.
5. Please refer to the EUT photo document (Reference No.: 191017N023) for detailed product photo.

6. The EUT can be powered by adapter as list as attach:

ADAPTER	
BRAND:	HUAWEI
MODEL:	HW-24-12AC14D
INPUT:	AC 100-240V, 0.8A, 50/60Hz
OUTPUT:	DC 12V/2A
DC LINE:	Unshielded, Non-detachable, 1.50m

7. Model List

S/N	02312SCU-005	02312SCU-010
Model	SmartLogger3000B02EU	SmartLogger3000A00GL
4G Module	No	No
MBUS	Yes	No
Exporting country	Europe	Global

2.2 DESCRIPTION OF TEST MODES

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

◆ **FOR CONDUCTED EMISSION TEST:**

Test Mode		Remark	Test Voltage
1	**MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**Class A (MBUS Port)**	**AC 230V/50Hz** AC 110V/60Hz
2	**MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**Class A (AC Mains Port)**	**AC 230V/50Hz** AC 110V/60Hz
3	**COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**Class B (AC Mains Port)**	AC 230V/50Hz **AC 110V/60Hz**

◆ **FOR CONDUCTED EMISSION TEST AT TELECOMMUNICATION PORT:**

Test Mode		Test Port	Test Voltage
1	**MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**GE Port (RJ 45)**	AC 230V/50Hz AC 110V/60Hz **DC 24V**
2	**MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**COM Port**	**AC 230V/50Hz** AC 110V/60Hz DC 24V
3	**COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**GE Port (RJ 45)**	AC 230V/50Hz AC 110V/60Hz **DC 24V**
4	**COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**COM Port**	**AC 230V/50Hz** AC 110V/60Hz DC 24V

◆ **FOR RADIATED EMISSIONS TEST (BELOW 1GHZ):**

	Test Mode	Test Voltage
1	**MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	AC 230V/50Hz AC 110V/60Hz **DC 24V**
2	**COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	AC 230V/50Hz **AC 110V/60Hz** DC 24V

◆ **FOR RADIATED EMISSIONS TEST (ABOVE 1GHZ):**

	Test Mode	Test Voltage
1	**MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**AC 230V/50Hz** AC 110V/60Hz DC 24V
2	**COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	AC 230V/50Hz **AC 110V/60Hz** DC 24V

◆ **FOR HARMONIC, FLICKERED TESTS:**

	Test Mode	Test Voltage
1	**MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	**AC 230V/50Hz**
2	**COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load**	

◆ **FOR ESD AND RS IMMUNITY TESTS:**

	Test Mode	Test Voltage
1	MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load	AC 230V/50Hz DC 24V
2	COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load	

◆ **FOR DIPS IMMUNITY TEST:**

	Test Mode	Test Voltage
1	MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load	AC 230V/50Hz AC 110V/60Hz
2	COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load	

◆ **FOR OTHER IMMUNITY TESTS:**

	Test Mode	Test Voltage
1	MBUS Data Acquisition + COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load	AC 230V/50Hz
2	COM Port*3 Connect PV Monitor Board Data Acquisition + RJ 45 (WAN Port + LAN Port) Data Acquisition (1Gbps) and display + Wifi Data Acquisition +SFP (1Gbps) Data Acquisition + DI and DO and AI Port Connect Dummy Load	

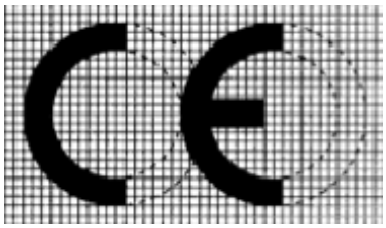
2.3 TEST PROGRAM USED AND OPERATION DESCRIPTIONS

a. Turn on the power supply of the EUT.
b. EUT was operated according to the type description in manufacturer's specifications or the User's Manual.

2.4 MISCELLANEOUS

➢ Affix CE marking

The marking must be placed visibly and legibly on the product or, if not possible due to the nature of the product, be affixed to the packaging and the accompanying document. The CE marking shall consist of the initials 'CE' taking the following form:



The various components of the CE marking must have the same vertical dimension, and may not be smaller than 5 mm. If the CE marking is reduced or enlarged, the proportions given in the graduated drawing above must be respected.

When the product is subject to other Directives covering other aspects and which also provide for the 'CE' marking, the accompanying documents must indicate that the product also conforms to those other Directives.

However, when one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the 'CE' marking has to indicate conformity only with the Directives applied by the manufacturer. In this case, the particularities of the Directives applied, as published in the Official Journal of the European Union, must be given in the documents, notices or instructions required by the Directives and accompanying such products.

2.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturers, the EUT must comply with the requirements of the following standards:

EN 55032:2015

CISPR 32:2015

AS/NZS CISPR 32:2015

EN 55011:2016+A1:2017 (GROUP 1)*

CISPR 11:2016+A1:2017 (GROUP 1)*

AS CISPR 11:2017 (GROUP 1)*

EN 61000-3-2:2014

IEC 61000-3-2:2014

EN 61000-3-3:2013

IEC 61000-3-3:2013

EN 55035:2017

CISPR 35:2016

EN 55024:2010+A1:2015

CISPR 24:2010+A1:2015

IEC 61000-4-2:2008 ED. 2.0
IEC 61000-4-3:2010 ED. 3.2
IEC 61000-4-4:2012 ED. 3.0
IEC 61000-4-5:2017 ED. 3.1
IEC 61000-4-6:2013 ED. 4.0
IEC 61000-4-11:2004 ED. 2.0

FINAL DRAFT EN 301 489-1 V2.2.2 (2019-09)
DRAFT EN 301 489-17 V3.2.0(2017-03)

EN 61000-4-2:2009
EN 61000-4-3:2006 + A1:2008 + A2:2010
EN 61000-4-4:2012
EN 61000-4-5:2014 + A1:2017
EN 61000-4-6:2014
EN 61000-4-11:2004

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

*The MBUS communication mode only apply to this standard class A limit.

2.6 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent 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	MONITOR BOARD	HUAWEI	ENE3COMA	024XDXHVJC00 6401	N/A
2	MONITOR BOARD	HUAWEI	ENE3COMA	024XDXHVJC00 6402	N/A
3	MONITOR BOARD	HUAWEI	ENE3COMA	024XDXHVJC00 6403	N/A
4	MONITOR BOARD	HUAWEI	ENE8COMA	101960040104	N/A
5	Optical module	HUAWEI	FTLF8519P2B NL-HW	PJA63NC	N/A
6	Computer	HP	HP COMPAQ 8200	A110824799	N/A
7	DC Power Source	Chroma	62050H-40	62050EA00084	N/A
8	PV Monitor Boaard	HUAWEI	N/A	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1-4	AC Line: Unshielded, Detachable 1.8m; RJ45 Cable: Shielded, Detachable 6m; RS485 Cable: Unshielded, Detachable 6m; MBUS Cable: Unshielded, Detachable 6m
5	SFP Cable: Unshielded, Detachable 6m;
6	AC Line: Unshielded, Detachable 1.8m;
7	AC Line: Unshielded, Detachable 1.8m; DC Line: Unshielded, Detachable 3.0m;
8	COM Cable: Unshielded, Detachable 3m;
9	AI, DI, DO Cable: Unshielded, Detachable 3m;

3 CONDUCTED EMISSION FROM THE AC MAINS POWER PORT

3.1 LIMITS

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 linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

EN 55011:

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

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

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

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

Limits only apply to low voltage AC mains power ports.

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

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

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

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

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

3.2 TEST INSTRUMENT

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESPI3	101505	Nov. 06, 2018	Nov. 05, 2019
Artificial Mains Network	SCHWARZBECK	NNLK8129	05184	Jan. 18, 2019	Jan. 17, 2020
Current probe	FCC	F-52	111659	Jan. 18, 2019	Jan. 17, 2020
Capacitive voltage probe	Teseq	CVP2200	31861	Apr. 25, 2019	Apr. 24, 2020
Test Software	R&S	EMC32 V10.50.00	N/A	N/A	N/A

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

2. The test was performed in Conducted shielding room.

3.3 TEST ARRANGEMENT

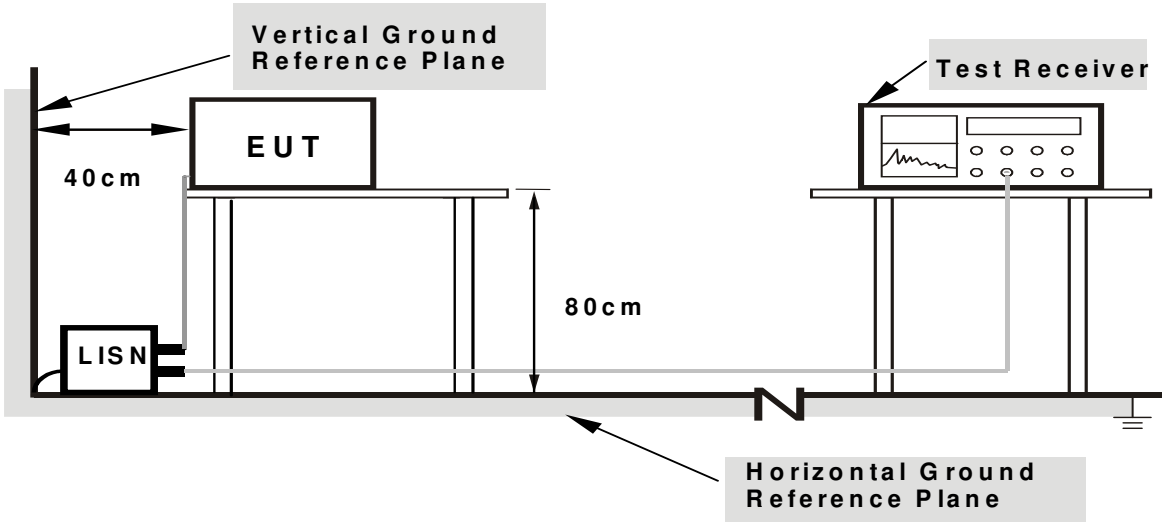
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

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

c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

3.4 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.

3.5 SUPPLEMENTARY INFORMATION

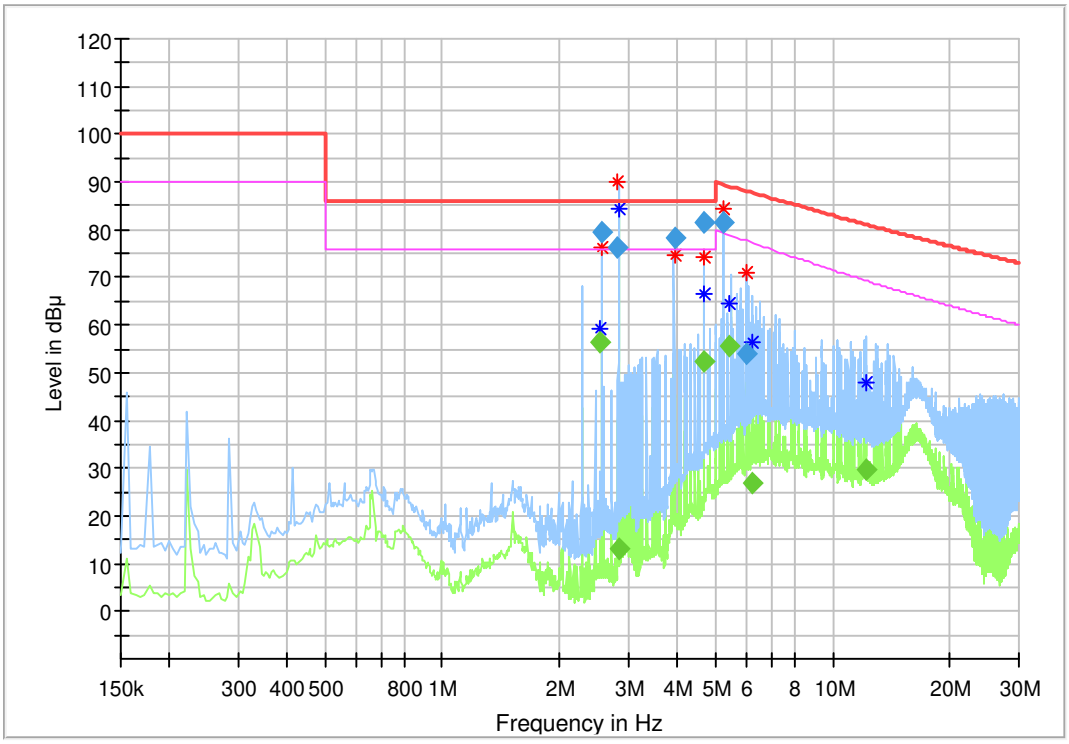
N/A

3.6 TEST RESULTS

TEST MODE	See section 2.2	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 12V from Adapter input AC 230V 50Hz	**TEST PORT**	MBUS
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH	**TESTED BY**	Wang Jia

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
2.540235	---	56.48	76.00	19.52	1000.0	9.000	L2	11.3
2.553735	79.59	---	86.00	6.41	1000.0	9.000	L2	11.3
2.817863	76.45	---	86.00	9.55	1000.0	9.000	L3	11.4
2.841638	---	12.93	76.00	63.07	1000.0	9.000	L3	11.4
3.940605	78.29	---	86.00	7.71	1000.0	9.000	L2	11.3
4.691340	---	52.53	76.00	23.47	1000.0	9.000	L2	11.3
4.691340	81.64	---	86.00	4.36	1000.0	9.000	L2	11.3
5.231303	81.50	---	89.53	8.02	1000.0	9.000	L2	11.3
5.459565	---	55.62	78.88	23.25	1000.0	9.000	L1	11.3
6.041843	54.17	---	88.03	33.86	1000.0	9.000	L2	11.4
6.256740	---	26.80	77.17	50.37	1000.0	9.000	L3	11.4
12.157973	---	29.79	69.36	39.57	1000.0	9.000	L3	11.4

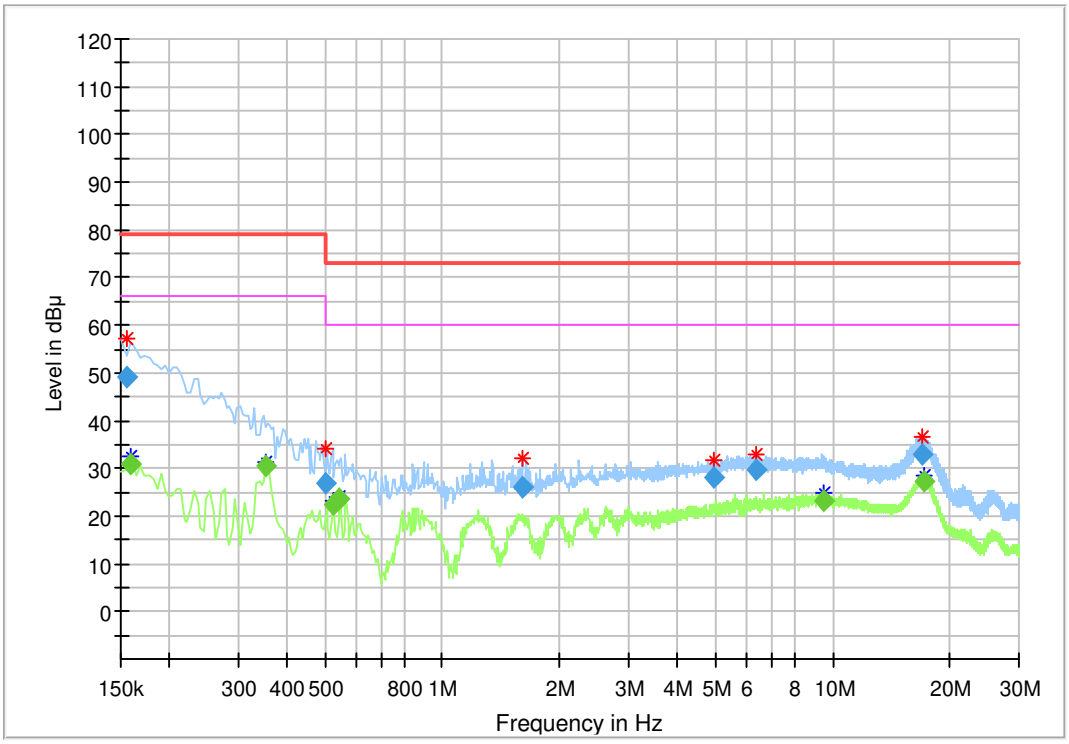
Full Spectrum



TEST MODE	See section 2.2	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 12V from Adapter input AC 230V 50Hz	TEST PORT	AC Mains (MBUS)
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH	TESTED BY	Wang Jia

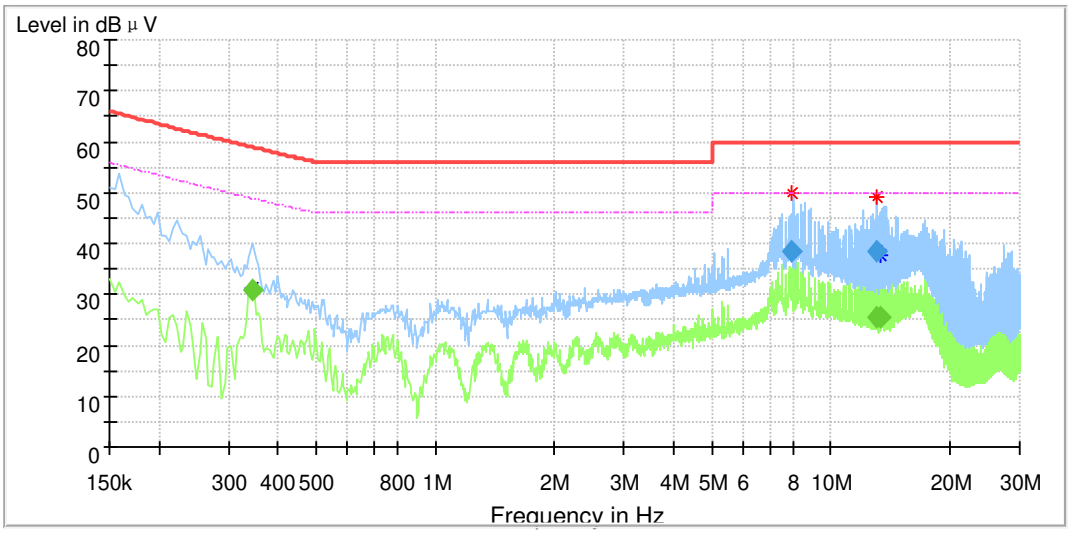
Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	49.21	---	79.00	29.79	15000.0	9.000	L3	0.1
0.159000	---	30.82	66.00	35.18	15000.0	9.000	L3	0.1
0.352500	---	30.49	66.00	35.51	15000.0	9.000	L2	0.1
0.501000	26.86	---	73.00	46.14	15000.0	9.000	L3	0.2
0.523499	---	22.21	60.00	37.79	15000.0	9.000	L2	0.1
0.546000	---	23.48	60.00	36.52	15000.0	9.000	L2	0.1
1.599983	26.00	---	73.00	47.00	15000.0	9.000	L2	0.1
4.958168	27.94	---	73.00	45.06	15000.0	9.000	L2	0.1
6.337245	29.70	---	73.00	43.30	15000.0	9.000	L3	0.2
9.458288	---	23.31	60.00	36.69	15000.0	9.000	L3	0.1
17.047853	33.06	---	73.00	39.94	15000.0	9.000	L2	0.4
17.244660	---	27.28	60.00	32.72	15000.0	9.000	L2	0.4

Full Spectrum



TEST MODE	See section 2.2	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 12V from Adapter input AC 110V 60Hz	**TEST PORT**	AC Mains (Class B)
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH	**TESTED BY**	Wang Jia

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.343500	---	30.77	48.91	18.14	15000.0	9.000	N	0.1
7.993943	38.46	---	60.00	21.54	15000.0	9.000	L1	0.2
13.017923	---	25.65	50.00	24.35	15000.0	9.000	L1	0.3
13.017923	38.33	---	60.00	21.67	15000.0	9.000	L1	0.3
13.403235	---	25.57	50.00	24.43	15000.0	9.000	L1	0.4



4 CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

4.1 LIMIT OF CONDUCTED ASYMMETRIC MODE DISTURBANCE AT TELECOMMUNICATION PORTS

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.

4.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESPI3	101505	Nov. 06, 2018	Nov. 05, 2019
Artificial Mains Network	SCHWARZBECK	NNLK8129	05184	Jan. 18, 2019	Jan. 17, 2020
Current probe	FCC	F-52	111659	Jan. 18, 2019	Jan. 17, 2020
Capacitive voltage probe	Teseq	CVP2200	31861	Apr. 25, 2019	Apr. 24, 2020
Test Software	R&S	EMC32 V10.50.00	N/A	N/A	N/A

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

4.3 TEST PROCEDURE

For using ISN:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

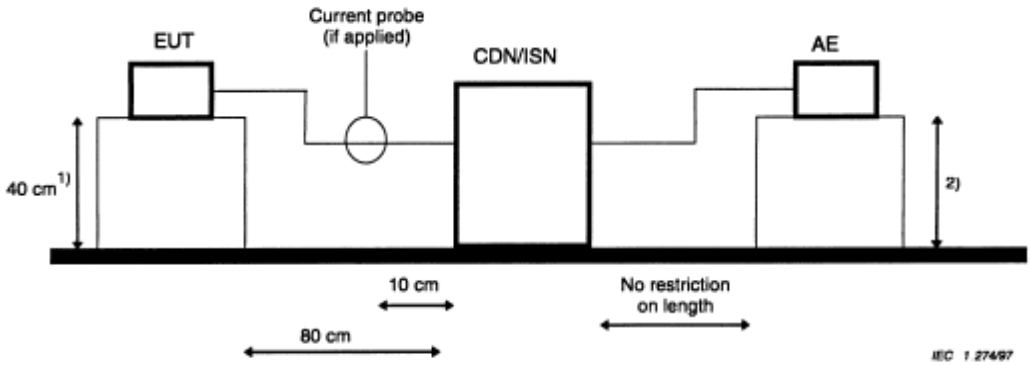
f. Compare adjusted voltage with the applicable voltage limit.

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

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

4.4 TEST SETUP

For using ISN:

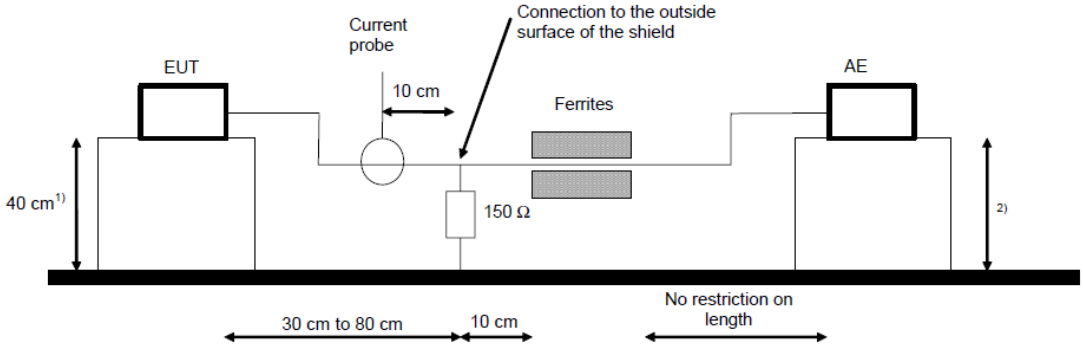


AE = Associated equipment
EUT = Equipment under test

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

2) Distance to the reference groundplane is not critical.

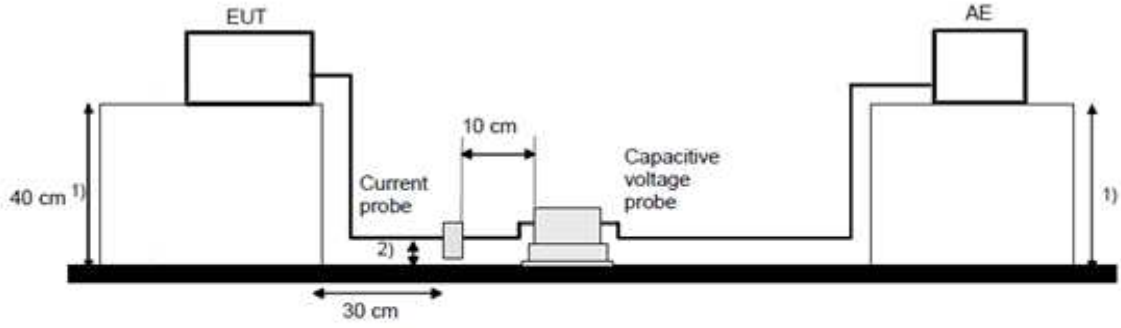
For using a 150 Ω load to the outside surface of the shield cable:



AE = Associated equipment
EUT = Equipment under test

1) Distance to the reference groundplane (vertical or horizontal).
2) Distance to the reference groundplane is not critical.

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



AE = Associated equipment
EUT = Equipment under test

1) Distance to the reference groundplane (vertical or horizontal)
2) Distance 4 ± 1 cm from the reference groundplane

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

4.5 SUPPLEMENTARY INFORMATION

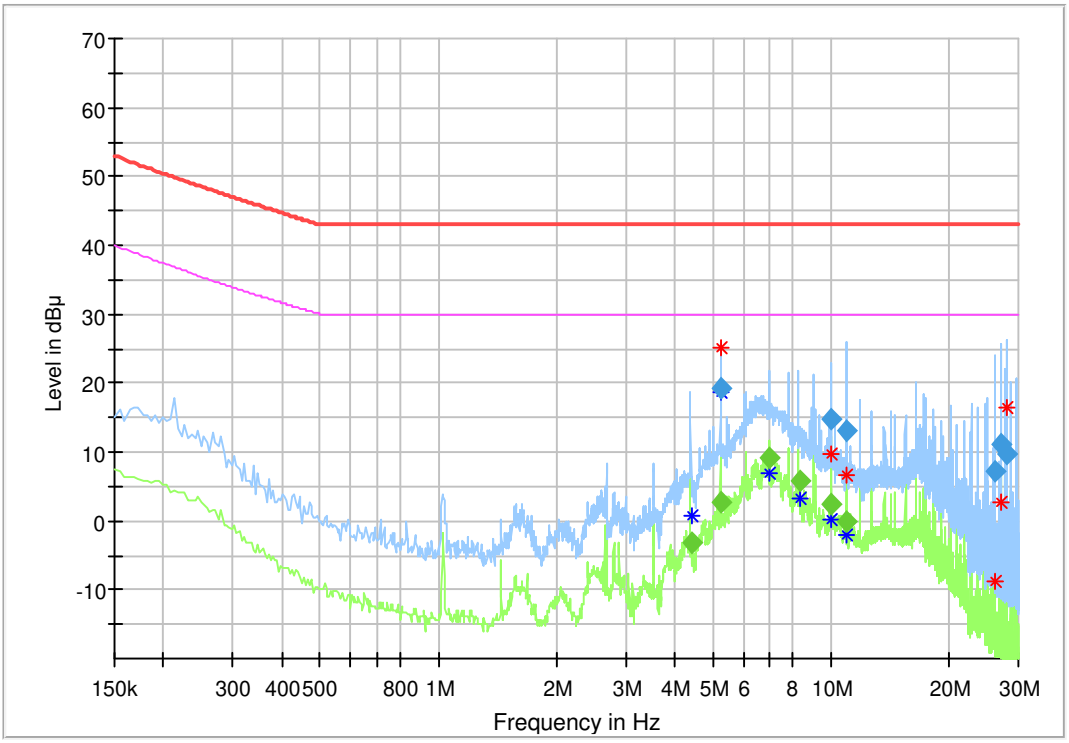
No deviation.

4.6 TEST RESULTS

TEST MODE	See section 2.2	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 24V From DC Source	**PHASE**	GE (RJ 45 Port) Class A
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH,	**TEST BY**	Wang Jia

Frequency (MHz)	QuasiPeak (dBµA)	Average (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Comment
4.419990	---	-3.29	30.00	33.29	15000.0	9.000	-13.3	
5.222258	19.25	---	43.00	23.75	15000.0	9.000	-13.8	
5.249258	---	2.60	30.00	27.40	15000.0	9.000	-13.8	
6.964253	---	9.14	30.00	20.86	15000.0	9.000	-14.6	
8.327430	---	5.85	30.00	24.15	15000.0	9.000	-15.0	
10.053840	14.83	---	43.00	28.17	15000.0	9.000	-15.4	
10.058363	---	2.38	30.00	27.62	15000.0	9.000	-15.4	
10.985318	13.12	---	43.00	29.88	15000.0	9.000	-15.5	
10.985318	---	-0.19	30.00	30.19	15000.0	9.000	-15.5	
26.151105	7.31	---	43.00	35.69	15000.0	9.000	-17.1	
26.978880	10.99	---	43.00	32.01	15000.0	9.000	-17.2	
27.910223	9.78	---	43.00	33.22	15000.0	9.000	-17.3	

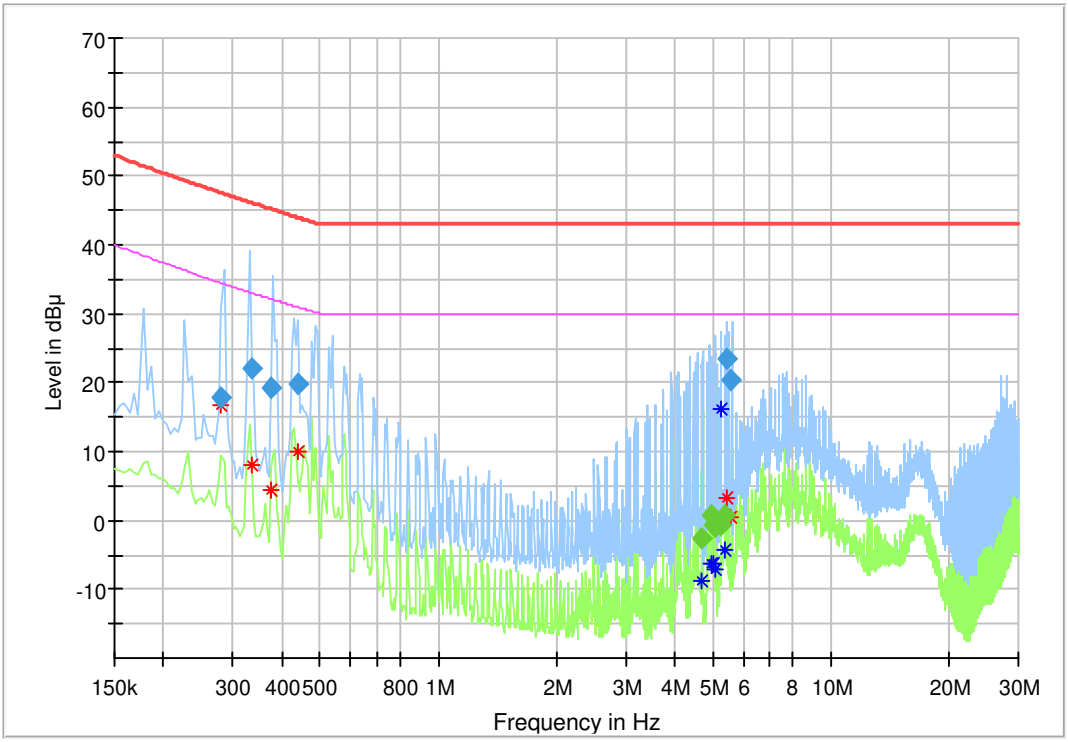
Full Spectrum



TEST MODE	See section 2.2	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 12V from Adapter input: AC 230V 50Hz	PHASE	COM Port Class A
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH,	TEST BY	Wang Jia

Frequency (MHz)	QuasiPeak (dB¦ìA)	Average (dB¦ìA)	Limit (dB¦ìA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Comment
0.280500	17.86	---	47.54	29.68	15000.0	9.000	-0.4	
0.334500	22.03	---	46.11	24.08	15000.0	9.000	-1.7	
0.374999	19.36	---	45.20	25.84	15000.0	9.000	-2.3	
0.438000	19.74	---	44.00	24.26	15000.0	9.000	-3.3	
4.711935	---	-2.49	30.00	32.49	15000.0	9.000	-13.5	
4.953810	---	0.82	30.00	29.18	15000.0	9.000	-13.7	
4.989675	---	-0.66	30.00	30.66	15000.0	9.000	-13.7	
5.097113	---	-0.93	30.00	30.93	15000.0	9.000	-13.8	
5.267258	---	-0.56	30.00	30.56	15000.0	9.000	-13.8	
5.387925	---	0.65	30.00	29.35	15000.0	9.000	-13.9	
5.446598	23.46	---	43.00	19.54	15000.0	9.000	-13.9	
5.562548	20.33	---	43.00	22.67	15000.0	9.000	-14.0	

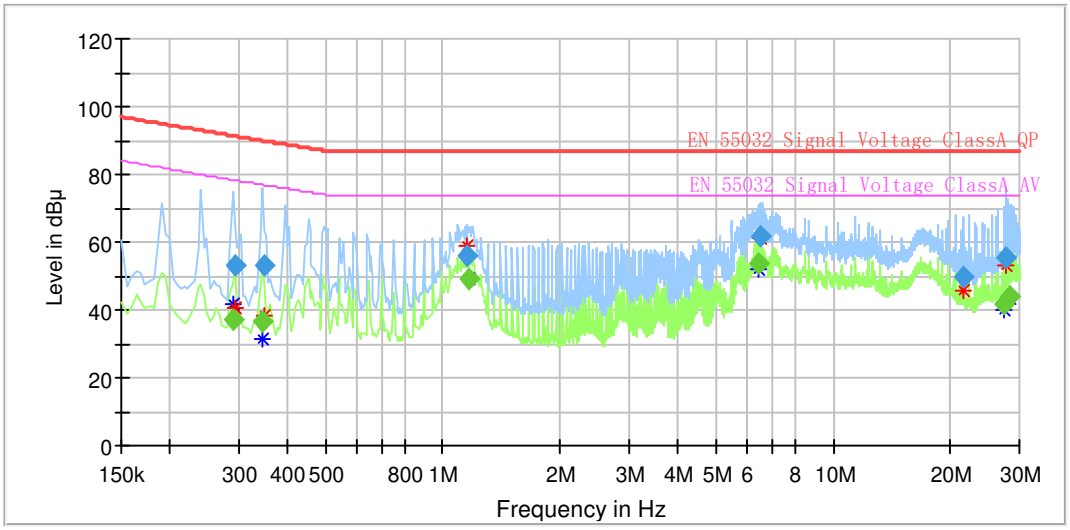
Full Spectrum



TEST MODE	See section 2.2	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 12V from Adapter input: AC 230V 50Hz	PHASE	COM Port Class A
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH,	TEST BY	Wang Jia

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.289500	---	37.22	78.38	41.17	1000.0	9.000	Single Line	22.8
0.294000	53.01	---	91.28	38.27	1000.0	9.000	Single Line	22.8
0.343500	---	36.50	76.98	40.49	1000.0	9.000	Single Line	22.8
0.348000	53.25	---	89.90	36.64	1000.0	9.000	Single Line	22.8
1.156710	55.85	---	87.00	31.15	1000.0	9.000	Single Line	22.8
1.161210	---	48.88	74.00	25.12	1000.0	9.000	Single Line	22.8
6.471615	---	53.86	74.00	20.14	1000.0	9.000	Single Line	22.7
6.516480	61.75	---	87.00	25.25	1000.0	9.000	Single Line	22.7
21.628583	49.74	---	87.00	37.26	1000.0	9.000	Single Line	22.8
27.373238	---	41.93	74.00	32.07	1000.0	9.000	Single Line	22.8
27.807825	55.19	---	87.00	31.81	1000.0	9.000	Single Line	22.8
28.367693	---	43.77	74.00	30.23	1000.0	9.000	Single Line	22.8

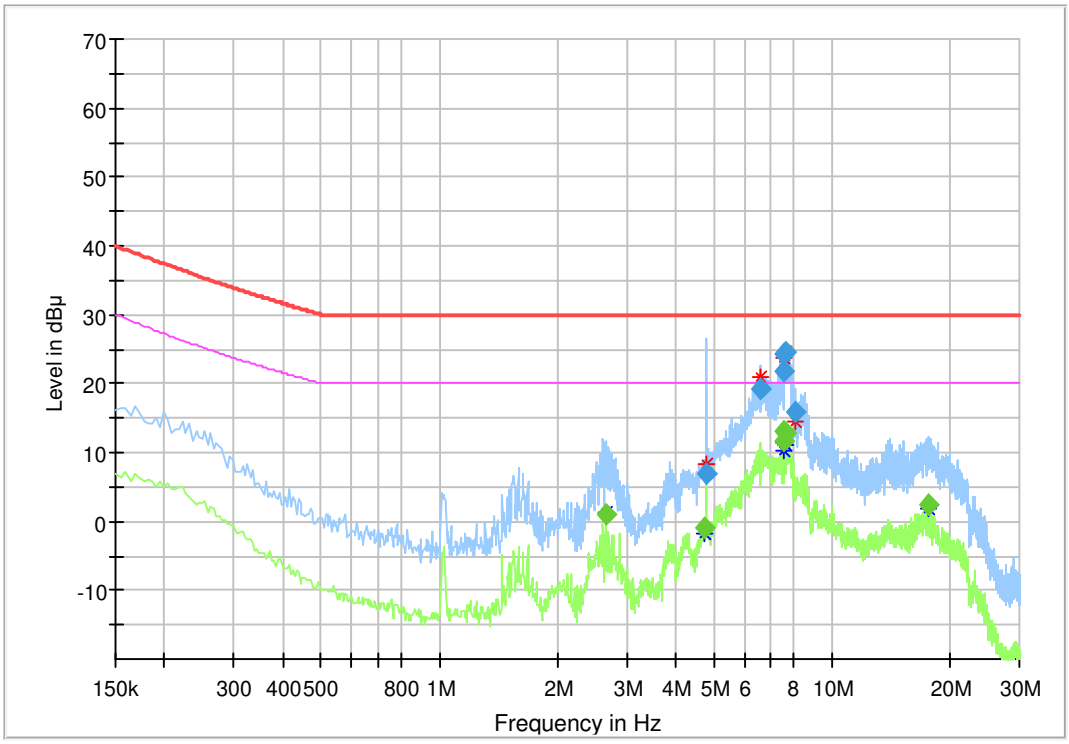
Full Spectrum



TEST MODE	See section 2.2	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 24V From DC Source	PHASE	GE (RJ 45 Port) Class B
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH,	TEST BY	Wang Jia

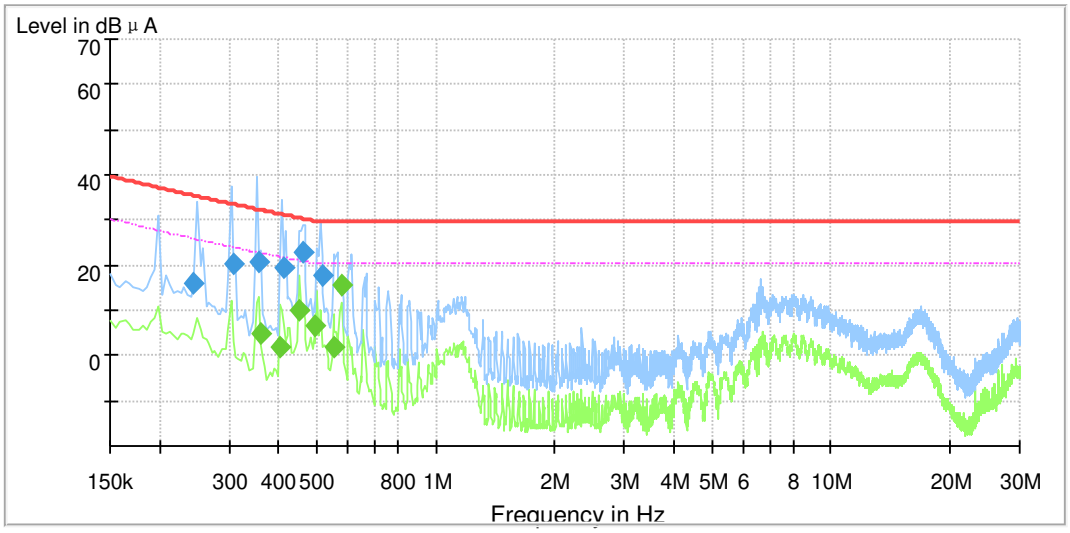
Frequency (MHz)	QuasiPeak (dBµA)	Average (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Comment
2.652240	---	1.09	20.00	18.91	15000.0	9.000	-11.5	
4.765575	---	-0.91	20.00	20.91	15000.0	9.000	-13.5	
4.801575	6.97	---	30.00	23.03	15000.0	9.000	-13.6	
6.592485	19.23	---	30.00	10.77	15000.0	9.000	-14.4	
7.513380	21.66	---	30.00	8.34	15000.0	9.000	-14.7	
7.519350	---	11.62	20.00	8.38	15000.0	9.000	-14.7	
7.567650	24.23	---	30.00	5.77	15000.0	9.000	-14.8	
7.568625	---	13.04	20.00	6.96	15000.0	9.000	-14.8	
7.609125	24.65	---	30.00	5.35	15000.0	9.000	-14.8	
7.622400	---	12.79	20.00	7.21	15000.0	9.000	-14.8	
8.052173	15.77	---	30.00	14.23	15000.0	9.000	-14.9	
17.665320	---	2.50	20.00	17.50	15000.0	9.000	-16.4	

Full Spectrum



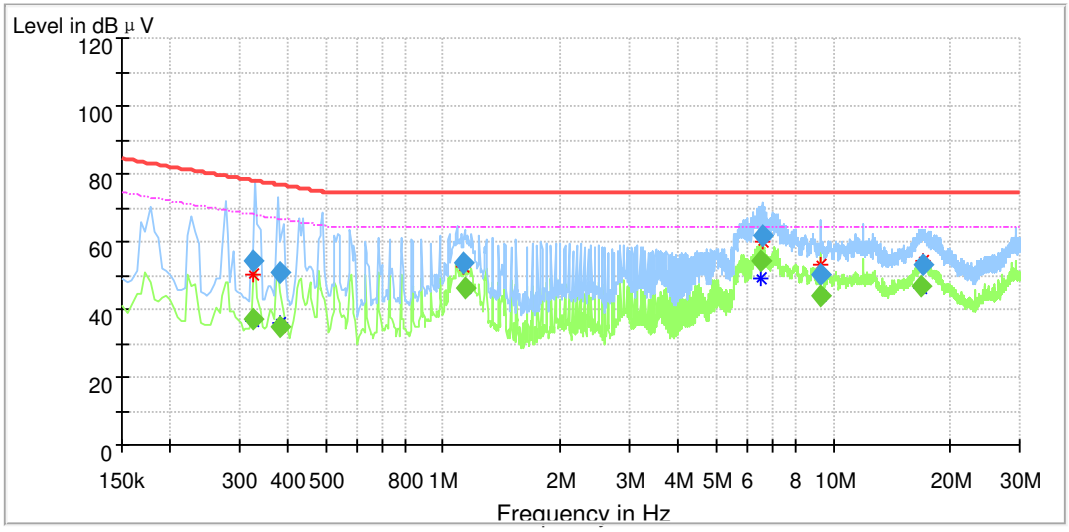
TEST MODE	See section 2.2	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 12V from Adapter input: AC 230V 50Hz	PHASE	COM Port Class B
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH,	TEST BY	Wang Jia

Frequency (MHz)	QuasiPeak (dB¦ìA)	Average (dB¦ìA)	Limit (dB¦ìA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Comment
0.244500	16.19	---	35.69	19.50	15000.0	9.000	1.1	
0.307500	20.26	---	33.79	13.53	15000.0	9.000	-1.3	
0.357000	20.54	---	32.59	12.05	15000.0	9.000	-2.1	
0.361500	---	4.95	22.42	17.47	15000.0	9.000	-2.1	
0.402000	---	1.99	21.61	19.62	15000.0	9.000	-2.8	
0.411000	19.42	---	31.49	12.07	15000.0	9.000	-2.9	
0.451500	---	9.87	20.74	10.87	15000.0	9.000	-3.5	
0.460500	22.85	---	30.62	7.77	15000.0	9.000	-3.7	
0.496500	---	6.63	20.05	13.42	15000.0	9.000	-4.2	
0.514501	17.91	---	30.00	12.09	15000.0	9.000	-4.4	
0.550500	---	1.73	20.00	18.27	15000.0	9.000	-4.8	
0.577500	---	15.44	20.00	4.56	15000.0	9.000	-5.0	



TEST MODE	See section 2.2	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 12V from Adapter input: AC 230V 50Hz	PHASE	COM Port Class B
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH,	TEST BY	Wang Jia

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.325500	---	37.17	67.42	30.25	1000.0	9.000	Single Line	22.8
0.325500	54.17	---	77.44	23.27	1000.0	9.000	Single Line	22.8
0.383999	---	34.93	66.09	31.16	1000.0	9.000	Single Line	22.8
0.383999	50.65	---	76.10	25.45	1000.0	9.000	Single Line	22.8
1.129823	53.56	---	74.00	20.44	1000.0	9.000	Single Line	22.8
1.134323	---	46.13	64.00	17.87	1000.0	9.000	Single Line	22.8
6.493980	---	54.15	64.00	9.85	1000.0	9.000	Single Line	22.7
6.570098	61.90	---	74.00	12.10	1000.0	9.000	Single Line	22.7
9.274485	50.10	---	74.00	23.90	1000.0	9.000	Single Line	22.7
9.301485	---	44.26	64.00	19.74	1000.0	9.000	Single Line	22.7
16.873005	---	46.72	64.00	17.28	1000.0	9.000	Single Line	22.8
16.963050	53.34	---	74.00	20.66	1000.0	9.000	Single Line	22.8



5 RADIATED EMISSION MEASUREMENT

5.1 LIMITS OF RADIATED EMISSION MEASUREMENT

FOR FREQUENCY BELOW 1000 MHz

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

FREQUENCY (MHz)	Class A (at 3m) Quasi-Peak dBuV/m	Class B (at 3m) Quasi-Peak dBuV/m
30 – 230	50	40
230 – 1000	57	47

Electromagnetic radiation disturbance limits for Class A: EN 55011

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

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

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

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

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

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

Distance (m)	Source	Frequency Range (MHz)	Limits dB (uV/m) Quasi-peak	
10	Local oscillator	≤1000	Fundamental	50
		30 to 300	Harmonics	42
		300 to 1000	Harmonics	46
	Other	30 to 230		30
		230 to 1000		37
3	Local oscillator	≤1000	Fundamental	60
		30 to 300	Harmonics	52
		300 to 1000	Harmonics	56
	Other	30 to 230		40
		230 to 1000		47

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.

5.2 TEST INSTRUMENTS

FREQUENCY RANGE BELOW 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Receiver	Agilent	N9038A	MY51210233	2019/07/31	2020/07/30
Spectrum Analyzer	Agilent	E4447A	MY52090002	2019/1/23	2020/1/22
Bilog antenna(30M-1G)	SCHWARZBECK	VULB 9163	481	2018/8/22	2020/8/21
Bilog antenna(30M-1G)	SCHWARZBECK	VULB 9163	549	2018/8/22	2020/8/21
Test Software	TOYO	EP7 V5.8.0	N/A	N/A	N/A

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

2. The test was performed in 10m Chamber.

FREQUENCY RANGE ABOVE 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	ETS-Lindgren	9120D	878	Jun. 02,19	Jun. 01, 20
EMI Test Receiver	Rohde&Schwarz	ESU40	100303	Jan. 21,19	Jan. 20, 20
Chamber	Albatross	3m Chamber	N/A	Dec. 01,18	Nov. 30,19
Test Software	Rohde&Schwarz	EMC32 V8.53.0	N/A	N/A	N/A

NOTE: 1.The test was performed by witness in 3m chamber of Reliability Laboratory of Huawei Technologies Co., Ltd.

2. The test was performed in 3m Chamber**.**

5.3 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 meter 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 1 meter to 4 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 rotatable 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 1GHz.

NOTE:

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

<Frequency Range above 1GHz>

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 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.

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

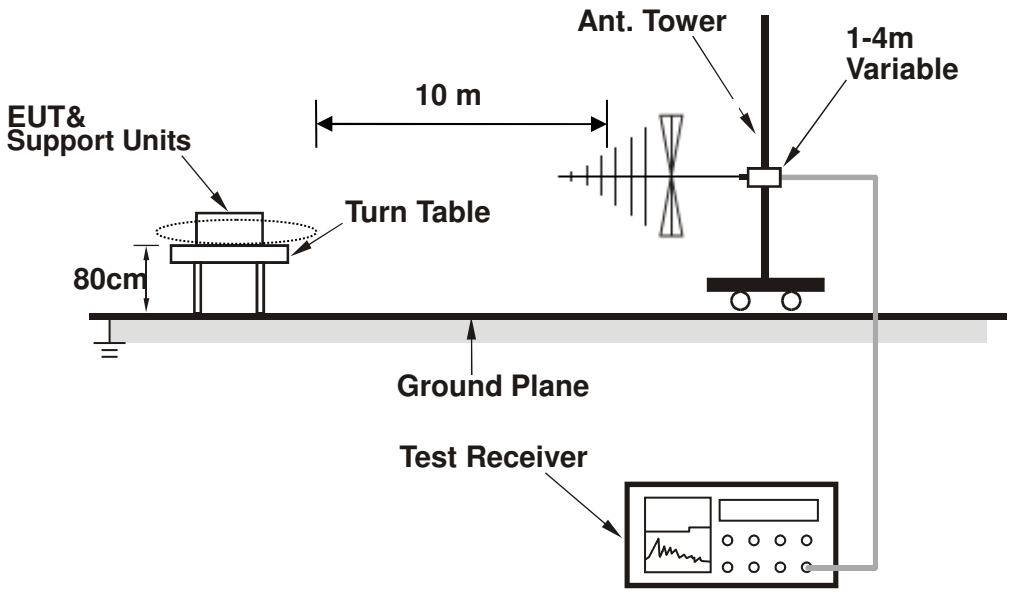
e. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTE:

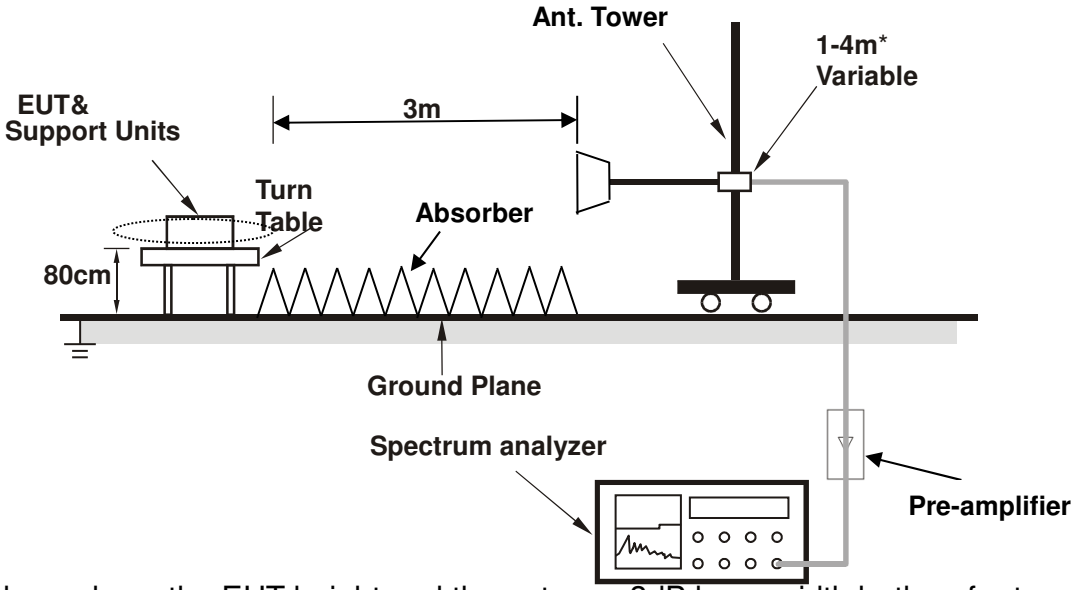
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above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

5.4 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

5.5 SUPPLEMENTARY INFORMATION

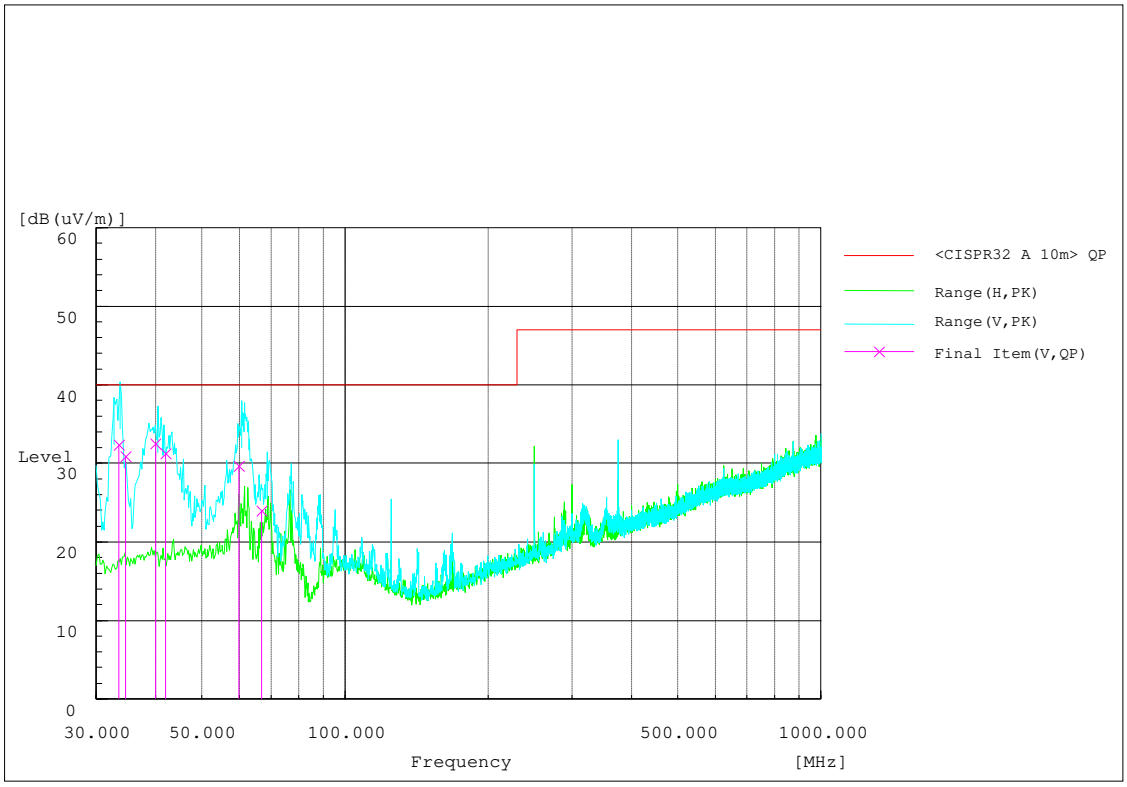
The more stringent measurement method of paragraph 8.3.2 in ANSI C63.4:2014 was applied for the test.

5.6 TEST RESULTS (BELOW 1GHz)

MBUS (Class A):

TEST MODE	See section 2.2	**FREQUENCY RANGE**	30-1000MHz
TEST VOLTAGE	DC 24V From DC Source	**DETECTOR FUNCTION & RESOLUTION BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25.0deg. C, 50.0% RH	**TESTED BY**: Wang Jia	

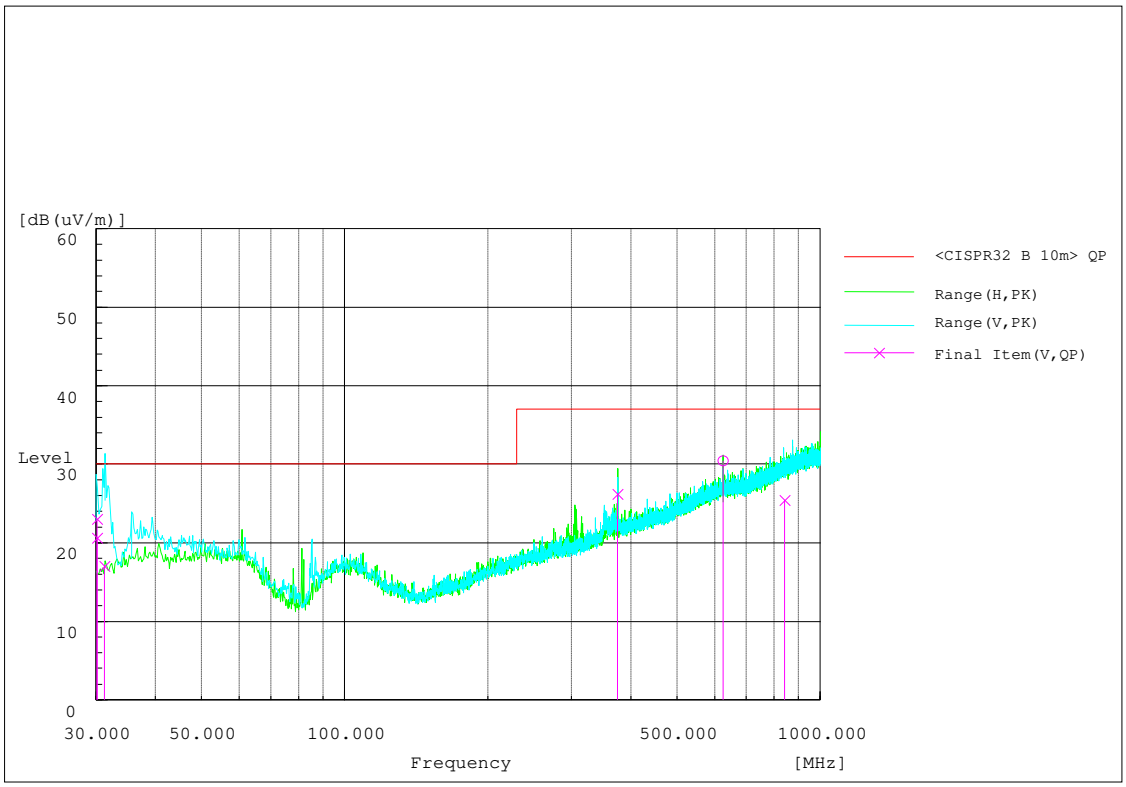
Frequency MHz	Level (dBuV/m)	Transd (dB)	Limit (dBuV/m)	Margin (d B)	Height cm	Angle deg	Polarization
34.562	30.9	-16.9	40.0	9.1	101.0	22.0	V
33.532	32.4	-17.2	40.0	7.6	114.0	279.0	V
41.954	31.2	-16.1	40.0	8.8	128.0	26.0	V
40.043	32.5	-16.1	40.0	7.5	135.0	239.0	V
59.847	29.7	-16.4	40.0	10.3	149.0	330.0	V
66.777	23.9	-18.5	40.0	16.1	204.0	317.0	V



Without MBUS (Class B):

TEST MODE	See section 2.2	**FREQUENCY RANGE**	30-1000MHz
TEST VOLTAGE	DC 12V From Adapter Input AC 110V/60Hz	**DETECTOR FUNCTION & RESOLUTION BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25.0deg. C, 50.0% RH	**TESTED BY**: Wang Jia	

Frequency MHz	Level (dBuV/m)	Transd (dB)	Limit (dBuV/m)	Margin (d B)	Height cm	Angle deg	Polarization
30.138	23.0	-18.4	30.0	7.0	128.0	352.0	V
30.134	20.7	-18.4	30.0	9.3	135.0	74.0	V
31.220	17.1	-18.0	30.0	12.9	103.0	326.0	V
375.004	26.2	-12.6	37.0	10.8	100.0	26.0	V
625.019	30.4	-7.3	37.0	6.6	135.0	85.0	H
841.696	25.5	-4.3	37.0	11.5	181.0	26.0	V

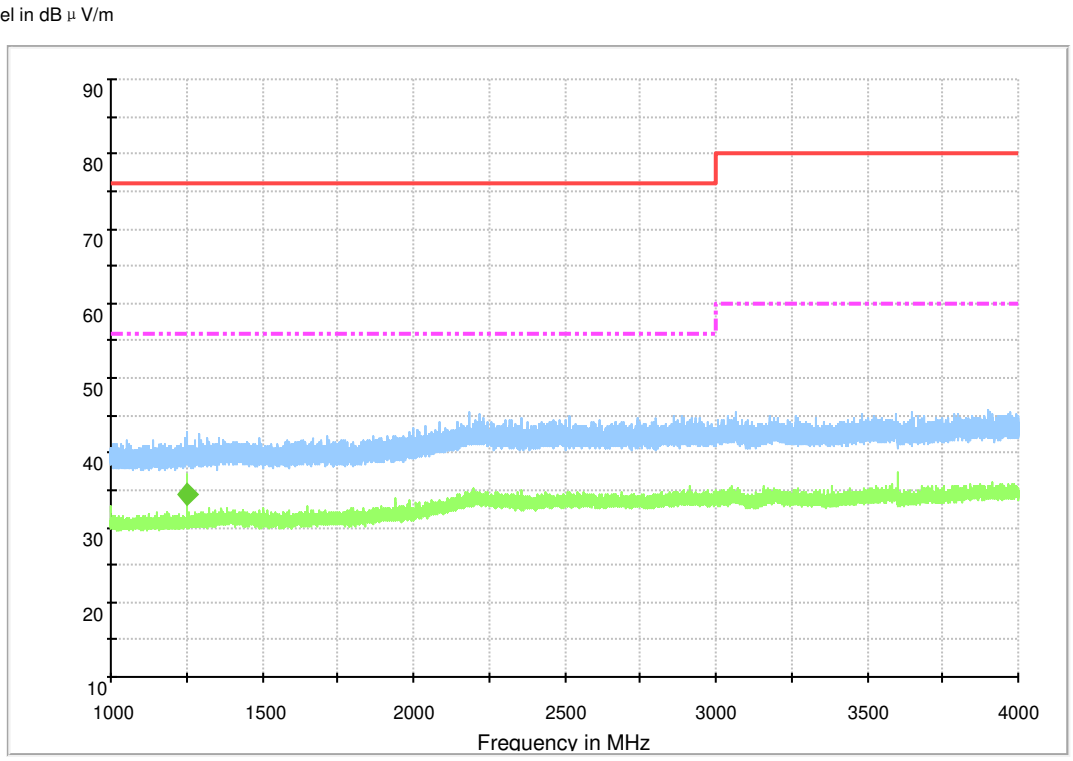


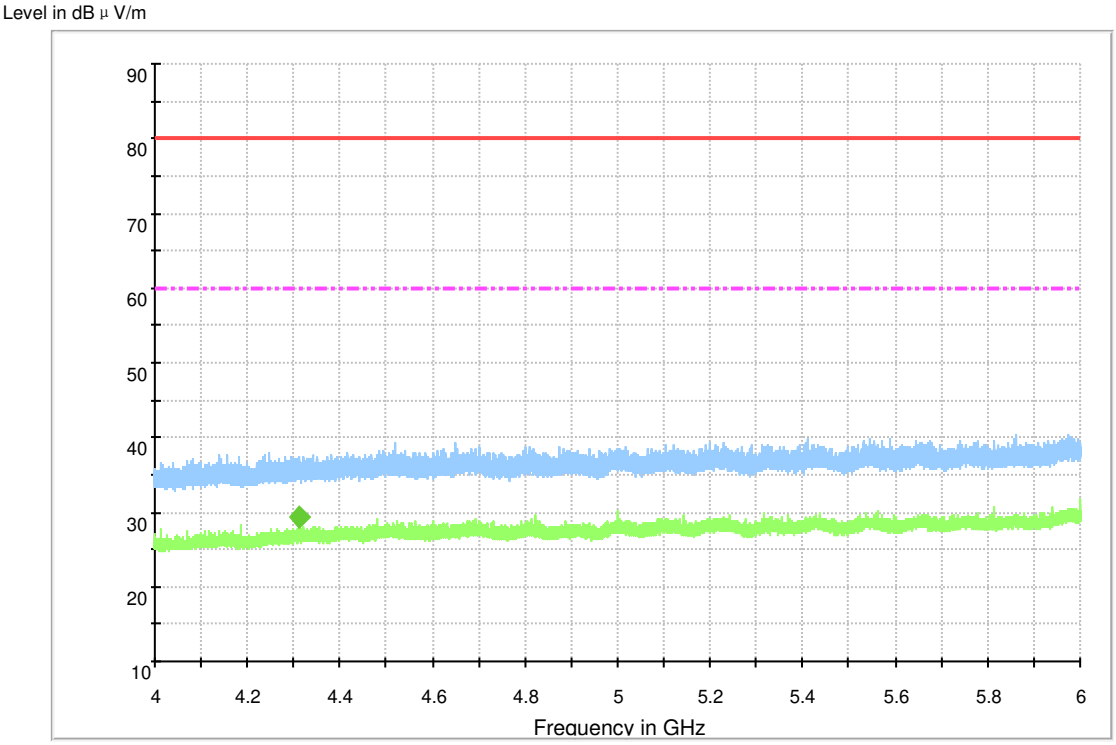
5.7 TEST RESULTS (ABOVE 1GHz)

MBUS (Class A):

TEST MODE	See section 2.2		
TEST VOLTAGE	DC 12V from Adapter input: AC 230V/50Hz	**FREQUENCY RANGE**	1-6 GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1250.200000	**34.4**	**1000.0**	**1000.000**	**100.0**	**H**	**129.0**	**-1.1**	**21.6**	**56.0**
4312.595500	29.4	1000.0	1000.000	100.0	V	330.0	-0.7	30.6	60.0

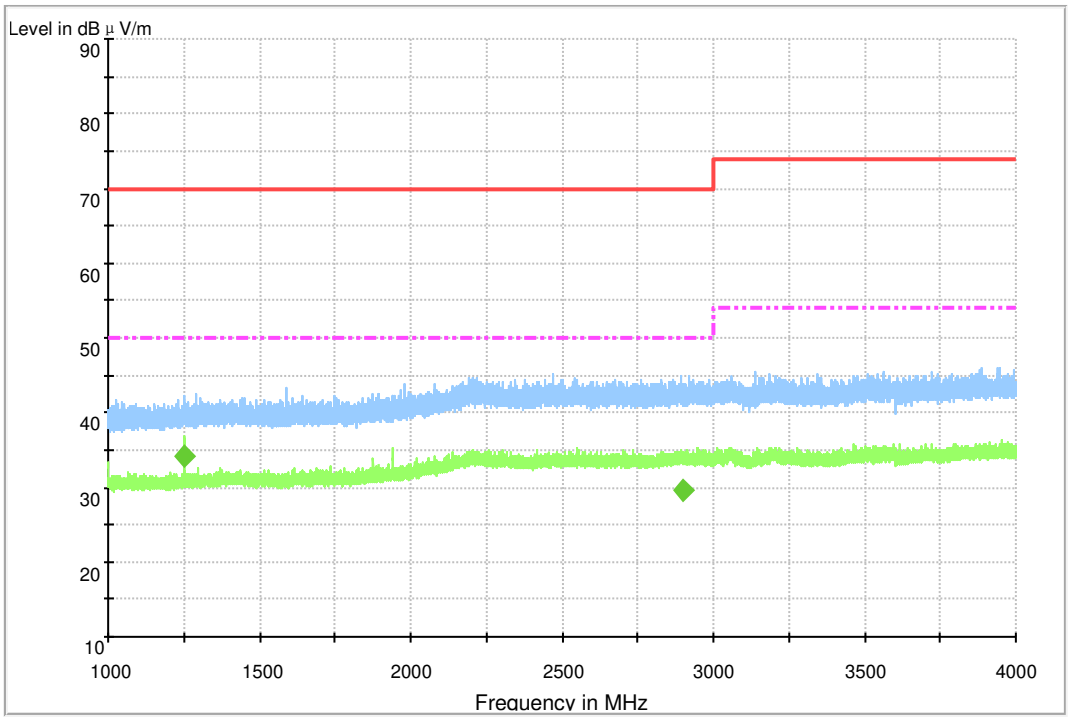


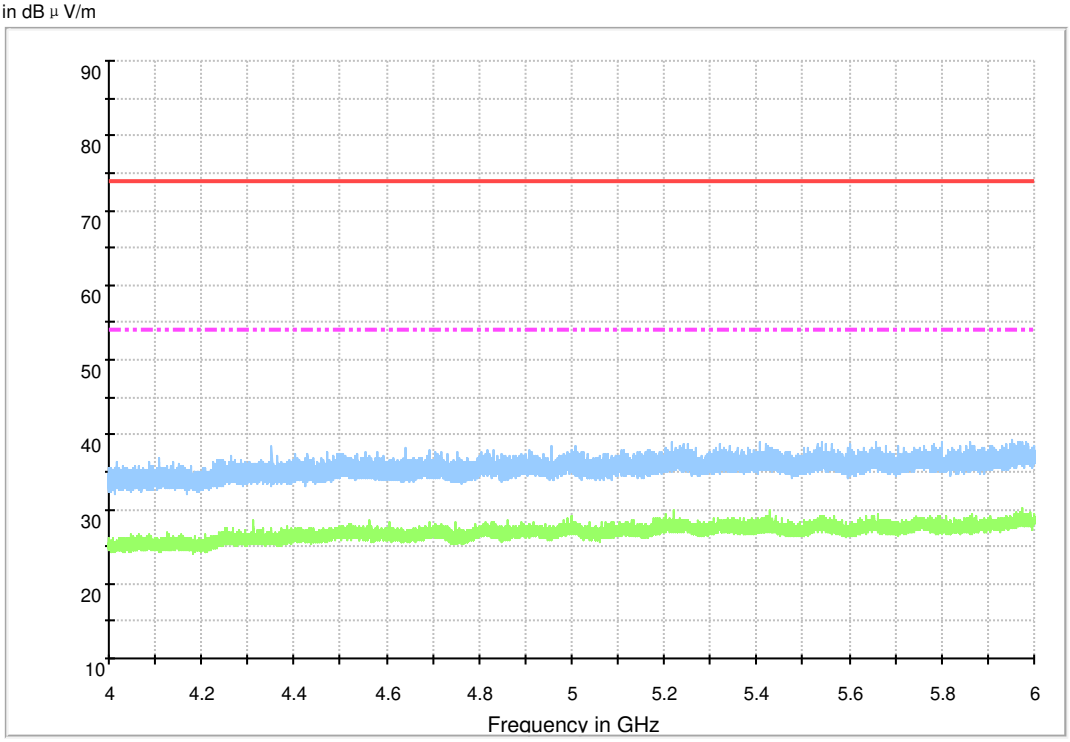

Level in dB µ V/m
90
80
70
60
50
40
30
20
10
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8
6
Frequency in GHz

Without MBUS (Class B):

TEST MODE	See section 2.2		
TEST VOLTAGE	DC 12V from Adapter input: AC 110V/60Hz	**FREQUENCY RANGE**	1-6 GHz
ENVIRONMENTAL CONDITIONS	25deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1250.000000	34.2	1000.0	1000.000	100.0	V	187.0	-1.1	15.8	50.0
2901.197500	29.5	1000.0	1000.000	100.0	H	106.0	5.2	20.5	50.0




Level in dB µ V/m
90
80
70
60
50
40
30
20
10
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8
6
Frequency in GHz

6 HARMONICS CURRENT MEASUREMENT

6.1 LIMITS

Limits for Class A equipment	
Harmonic Order n	Max. permissible harmonics current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15≦n≦39	0.15 x 15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8≦n≦40	0.23 x 8/n

Limits for Class D equipment		
Harmonic Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15≦n≦39	3.85/n	0.15 x 15/n

NOTE: 1. Class A and Class D are classified according to section 5 of EN 61000-3-2.
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

Classification of Equipment

The EUT is Class A in accordance with EN 61000-3-2 as follows:

Class A	Class B	Class C	Class D
Balanced three-phase equipment; Household appliances excluding equipment as Class D; Tools excluding portable tools; Dimmers for incandescent lamps; Audio equipment; Equipment not specified in one of the three other classes.	Portable tools; Arc welding equipment which is not professional equipment.	Lighting equipment.	Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors; Television receivers; Refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

6.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
5kVA AC Power Source	EMTEST	ACS 500N6	V1143110987	Jan. 24,19	Jan. 23, 20
Harmonic/Flicker Test System	EMTEST	DPA 503N	V1143110985	Jan. 23,19	Jan. 22, 20
Test Software	EMTEST	dpa.contral V5.2.0	N/A	N/A	N/A

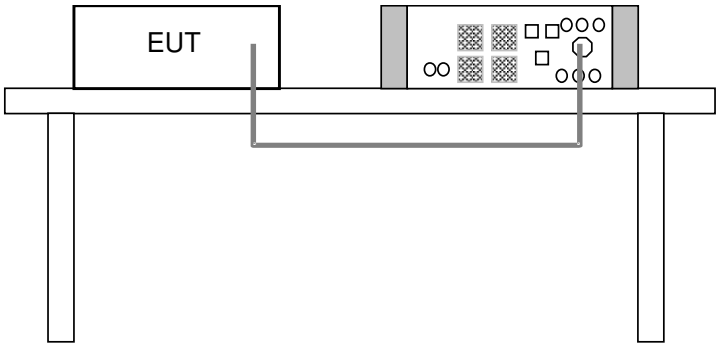
NOTE: 1.The test was performed by witness in H/F Room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in Harmonics Room.

6.3 TEST ARRANGEMENT

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

b. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

6.4 TEST SETUP



6.5 TEST RESULTS

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	34.593E-3			
2	685.002E-6	0.063	1.08	PASS
3	29.700E-3	1.291	2.30	PASS
4	492.869E-6	0.115	430.00E-3	PASS
5	28.511E-3	2.501	1.14	PASS
6	609.906E-6	0.203	300.00E-3	PASS
7	26.795E-3	3.480	770.00E-3	PASS
8	491.282E-6	0.214	230.00E-3	PASS
9	24.464E-3	6.116	400.00E-3	PASS
10	399.715E-6	0.217	184.00E-3	PASS
11	21.991E-3	6.664	330.00E-3	PASS
12	349.337E-6	0.228	153.33E-3	PASS
13	19.244E-3	9.164	210.00E-3	PASS
14	302.324E-6	0.230	131.43E-3	PASS
15	16.143E-3	10.762	150.00E-3	PASS
16	244.045E-6	0.212	115.00E-3	PASS
17	13.309E-3	10.056	132.35E-3	PASS
18	190.928E-6	0.187	102.22E-3	PASS
19	10.332E-3	8.725	118.42E-3	PASS
20	183.356E-6	0.199	92.00E-3	PASS
21	7.552E-3	4.699	160.71E-3	PASS
22	154.137E-6	0.184	83.64E-3	PASS
23	5.214E-3	3.553	146.74E-3	PASS
24	155.925E-6	0.203	76.66E-3	PASS
25	2.935E-3	2.174	135.00E-3	PASS
26	159.095E-6	0.225	70.77E-3	PASS
27	1.401E-3	1.121	124.99E-3	PASS
28	167.928E-6	0.256	65.71E-3	PASS
29	750.596E-6	0.645	116.39E-3	PASS
30	170.879E-6	0.279	61.33E-3	PASS
31	1.584E-3	1.455	108.87E-3	PASS
32	184.705E-6	0.321	57.50E-3	PASS
33	2.032E-3	1.987	102.27E-3	PASS
34	168.579E-6	0.311	54.12E-3	PASS
35	2.388E-3	2.477	96.44E-3	PASS
36	189.984E-6	0.372	51.11E-3	PASS
37	2.431E-3	2.665	91.21E-3	PASS
38	181.058E-6	0.374	48.42E-3	PASS
39	2.186E-3	2.526	86.53E-3	PASS
40	169.044E-6	0.367	46.00E-3	PASS

Maximum harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	43.357E-3			
2	1.284E-3	0.079	1.62	PASS
3	30.931E-3	0.897	3.45	PASS
4	706.879E-6	0.110	645.00E-3	PASS
5	29.510E-3	1.726	1.71	PASS
6	863.533E-6	0.192	450.00E-3	PASS
7	27.730E-3	2.401	1.15	PASS
8	642.058E-6	0.186	345.00E-3	PASS
9	25.272E-3	4.212	600.00E-3	PASS
10	564.003E-6	0.204	276.00E-3	PASS
11	22.822E-3	4.611	495.00E-3	PASS
12	509.343E-6	0.221	229.99E-3	PASS
13	19.935E-3	6.329	315.00E-3	PASS
14	408.970E-6	0.207	197.15E-3	PASS
15	16.603E-3	7.379	225.00E-3	PASS
16	332.628E-6	0.193	172.50E-3	PASS
17	13.753E-3	6.928	198.52E-3	PASS
18	271.005E-6	0.177	153.33E-3	PASS
19	10.652E-3	5.997	177.63E-3	PASS
20	274.457E-6	0.199	138.00E-3	PASS
21	7.791E-3	4.848	160.71E-3	PASS
22	228.081E-6	0.182	125.46E-3	PASS
23	5.464E-3	3.723	146.74E-3	PASS
24	210.404E-6	0.183	114.99E-3	PASS
25	3.100E-3	2.296	135.00E-3	PASS
26	239.395E-6	0.226	106.16E-3	PASS
27	1.536E-3	1.229	124.99E-3	PASS
28	219.621E-6	0.223	98.57E-3	PASS
29	890.331E-6	0.765	116.39E-3	PASS
30	231.358E-6	0.251	92.00E-3	PASS
31	1.758E-3	1.615	108.87E-3	PASS
32	253.760E-6	0.294	86.25E-3	PASS
33	2.163E-3	2.115	102.27E-3	PASS
34	243.658E-6	0.300	81.18E-3	PASS
35	2.583E-3	2.678	96.44E-3	PASS
36	265.959E-6	0.347	76.66E-3	PASS
37	2.573E-3	2.821	91.21E-3	PASS
38	260.893E-6	0.359	72.63E-3	PASS
39	2.336E-3	2.700	86.53E-3	PASS
40	234.318E-6	0.340	69.00E-3	PASS

Maximum harmonic voltage results

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	230.57	100.248		
2	18.91E-3	0.008	0.2	PASS
3	97.25E-3	0.042	0.9	PASS
4	21.74E-3	0.009	0.2	PASS
5	19.02E-3	0.008	0.4	PASS
6	11.22E-3	0.005	0.2	PASS
7	18.60E-3	0.008	0.3	PASS
8	8.22E-3	0.004	0.2	PASS
9	98.24E-3	0.043	0.2	PASS
10	13.37E-3	0.006	0.2	PASS
11	51.91E-3	0.023	0.1	PASS
12	15.53E-3	0.007	0.1	PASS
13	38.36E-3	0.017	0.1	PASS
14	16.18E-3	0.007	0.1	PASS
15	69.62E-3	0.030	0.1	PASS
16	9.14E-3	0.004	0.1	PASS
17	69.83E-3	0.030	0.1	PASS
18	5.89E-3	0.003	0.1	PASS
19	34.89E-3	0.015	0.1	PASS
20	8.79E-3	0.004	0.1	PASS
21	44.75E-3	0.019	0.1	PASS
22	5.98E-3	0.003	0.1	PASS
23	68.62E-3	0.030	0.1	PASS
24	5.91E-3	0.003	0.1	PASS
25	40.60E-3	0.018	0.1	PASS
26	7.39E-3	0.003	0.1	PASS
27	32.06E-3	0.014	0.1	PASS
28	6.39E-3	0.003	0.1	PASS
29	46.33E-3	0.020	0.1	PASS
30	4.12E-3	0.002	0.1	PASS
31	50.65E-3	0.022	0.1	PASS
32	5.86E-3	0.003	0.1	PASS
33	26.44E-3	0.011	0.1	PASS
34	6.56E-3	0.003	0.1	PASS
35	32.09E-3	0.014	0.1	PASS
36	6.70E-3	0.003	0.1	PASS
37	49.36E-3	0.021	0.1	PASS
38	5.33E-3	0.002	0.1	PASS
39	28.46E-3	0.012	0.1	PASS
40	6.68E-3	0.003	0.1	PASS

7 VOLTAGE FLUCTUATIONS AND FLICKER MEASUREMENT

7.1 LIMITS

Test item	Limit	Note
P_{st}	1.0	P_{st}: short-term flicker severity.
P_{lt}	0.65	P_{lt}: long-term flicker severity.
T_{max} (ms)	500	T_{max}: maximum time duration during the observation period that the voltage deviation d(t) exceeds the limit for d_c .
d_{max} (%)	4	d_{max}: maximum absolute voltage change during an observation period.
d_c (%)	3.3	d_c: maximum steady state voltage change during an observation period.

7.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
5kVA AC Power Source	EMTEST	ACS 500N6	V1143110987	Jan. 24,19	Jan. 23, 20
Harmonic/Flicker Test System	EMTEST	DPA 503N	V1143110985	Jan. 23,19	Jan. 22, 20
Test Software	EMTEST	dpa.contral V5.2.0	N/A	N/A	N/A

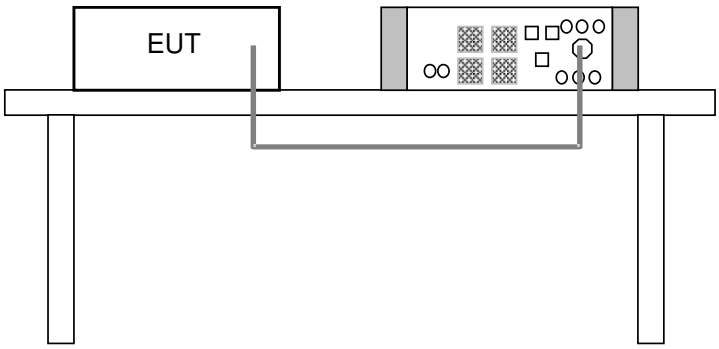
NOTE: 1.The test was performed by witness in H/F Room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in Harmonics Room.

7.3 TEST ARRANGEMENT

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

b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.4 TEST SETUP



7.5 TEST RESULTS

Observation (T_p)	10 min.	Test Date	2019/09/17
Fundamental Voltage/Ampere	229.98Vrms	Power Frequency	50.00Hz
Environmental Conditions	25.0deg. C, 50.0% RH	Tested by	Wang Ji
Test Mode	See section 2.2		

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.032	4.00	PASS
dt [s]	0.000	0.50	PASS

Detail Flicker data

Flicker measurement 1	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.030	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 2	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 3	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 4	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 5	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 6	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 7	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 8	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 9	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.032	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 10	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.031	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 11	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.032	4.00	PASS
dt [s]	0.000	0.50	PASS

Flicker measurement 12	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.032	4.00	PASS
dt [s]	0.000	0.50	PASS

8 IMMUNITY TEST

8.1 GENERAL DESCRIPTION

8.1.1 GENERAL DESCRIPTION OF EN 55035

Product Standard	EN 55035:2017	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 3V/m, 80% AM (1kHz), 1800 MHz,3V/m, 80% AM (1kHz), 2600 MHz,3V/m, 80% AM (1kHz), 3500 MHz,3V/m, 80% AM (1kHz), 5000 MHz,3V/m, 80% AM (1kHz) Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT AC Power line: 1kV, DC Power line: 0.5kV Signal line: 0.5kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, 10/700 us Open Circuit Voltage, 5 /320 us Short Circuit Current, AC Power Line: line to line 1 kV, line to earth 2kV Signal line: 1kV, 4kV Shielded line and DC line:0.5kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-10 MHz, 3Vrms, 10MHz-30MHz, 3Vrms-1Vrms, 30MHz-80MHz, 1Vrms 80% AM, 1kHz Performance Criterion A

	IEC 61000-4-11	Meets the requirements of Voltage Dips: i) reduction for >95% Performance Criterion B ii) reduction for 30% Performance Criterion C iii) reduction for >95% Performance Criterion C

Product Standard	**EN 55024:2010+A1:2015**	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 8Kv air discharge, 4Kv Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst – EFT AC Power line: 1kV, DC Power line: 0.5 kV Signal line: 0.5 kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8/20 us Short Circuit Current, AC Power Line：line to line：1 kV, line to earth：2kV;DC Power Line：line to line：0.5 kV, line to earth：0.5kV Signal line: 1 kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-11	Meets the requirements of Voltage Dips: i) reduction for >95% Performance Criterion B ii) reduction for 30% Performance Criterion C iii) reduction for >95% Performance Criterion C

Product Standard	Final draft EN 301 489-1 V2.2.2 (2019-09) Draft EN 301 489-17 V3.2.0 (2017-03)	
Basic Standard, Specification, and Performance Criterion required	EN 61000-4-2	Electrostatic Discharge – ESD: 8 kV air discharge, 4 kV contact discharge, Performance Criterion B
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~ 6000 MHz, 3 V/m, 80% AM (1 kHz), Performance Criterion A
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT, AC power line: 1 kV Performance Criterion B
	EN 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, Power line: line to line 1 kV, line to ground 2 kV Performance Criterion B
	EN 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15 ~ 80 MHz, 3 Vrms, 80% AM, 1 kHz, Performance Criterion A
	EN 61000-4-11	Voltage Dips: i) 0% residual for 0.5 cycle, Performance Criterion B ii) 0% residual for 1 cycle, Performance Criterion B iii) 70% residual for 25 cycle, Performance Criterion C Voltage Interruptions: iv) 0% residual for 250 cycle, Performance Criterion C

8.1.2 PERFORMANCE CRITERIA

According to Clause 8.2, 8.3, 8.4 of EN 55035:2017 standard, the following describes the general performance criteria.

CRITERION A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment 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, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
CRITERION B	During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment 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), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
CRITERION C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

According to Clause 7.1 of EN 55024:2010+A1:2015 standard, the following describes the general performance criteria.

CRITERION A	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
CRITERION B	After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
CRITERION C	During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

FOR EN301489-17

The Requirement of Performance Criteria		
1	Performance criteria for continuous phenomena applied to transmitters (CT)	Criterion A of the applicable class shall apply
2	Performance criteria for transient phenomena applied to transmitters (TT)	Criterion B of the applicable class shall apply
3	Performance criteria for continuous phenomena applied to receivers (CR)	Criterion A of the applicable class shall apply
4	Performance criteria for transient phenomena applied to receivers (TR)	Criterion B of the applicable class shall apply

The phenomena allowed during and after test in each criterion are clearly stated in the following table.

Performance criteria		
Criteria	**During test**	**After test**
A	Shall operate as intended. (see note1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

8.1.3 EUT OPERATING CONDITION

Same as item 2.3

8.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

8.2.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Contact Discharge : 4 kV, 6kV (Direct &Indirect) Air Discharge: 8kV (Direct)
Polarity:	Positive / Negative
Number of Discharge:	For EN 55024: Air Discharge: 20 times at each test point Contact Discharge: 200 times in total For EN 55035 & EN 301 489: Air Discharge: min. 20 times at each test point Contact Discharge: min. 20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1-second

8.2.2 TEST INSTRUMENTS

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

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

8.2.3 TEST PROCEDURE

For EN 55024:The discharges shall be applied in two ways:

a. Contact discharges to the conductive surfaces and coupling planes:
The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b. Air discharges at slots and apertures and insulating surfaces:
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area

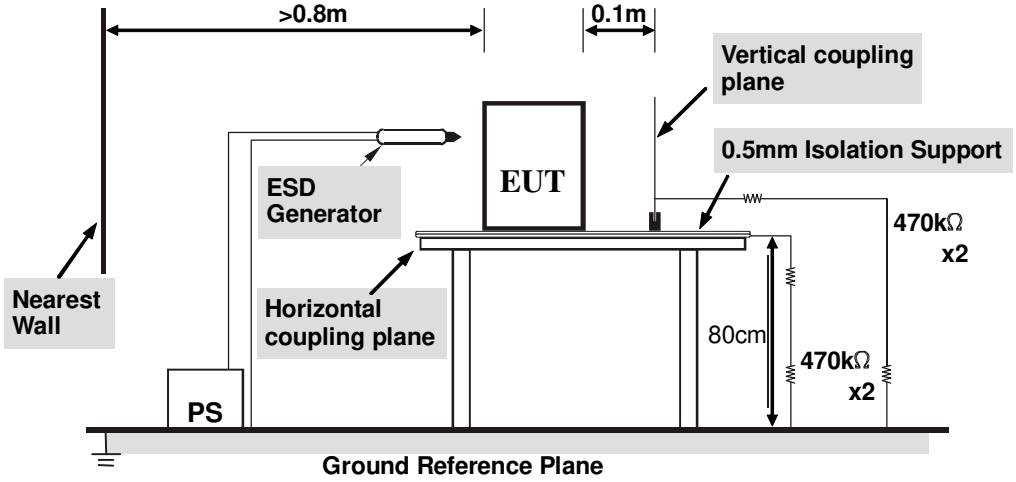
The basic test procedure was in accordance with IEC 61000-4-2:

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 horizontally 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.

8.2.4 DEVIATION FROM TEST STANDARD

No deviation.

8.2.5 TEST SETUP



NOTE:

TABLE-TOP EQUIPMENT

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

FLOOR-STANDING EQUIPMENT

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

8.2.6 TEST RESULTS

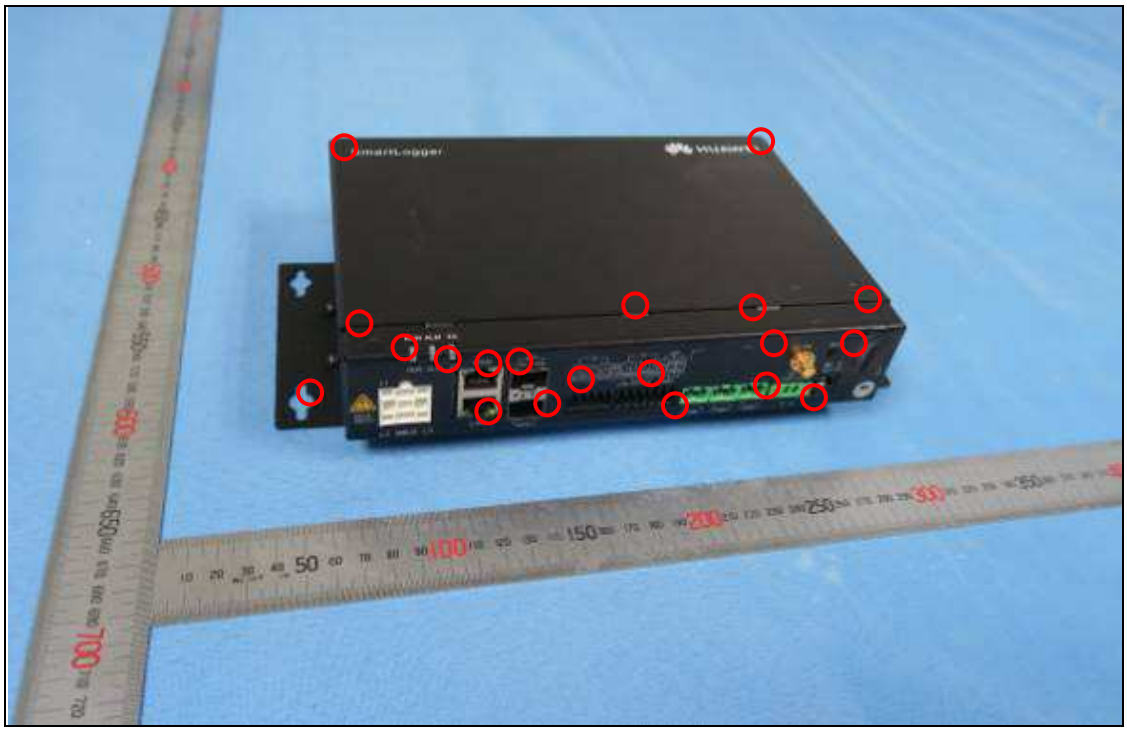
TEST MODE	See section 2.2	TEST VOLTAGE	DC 12V From Adapter Input AC 230V/50Hz or DC 24V
ENVIRONMENTAL CONDITIONS	24deg. C, 43.0% RH, 101.0kPa	**TESTED BY**: Wang Jia	

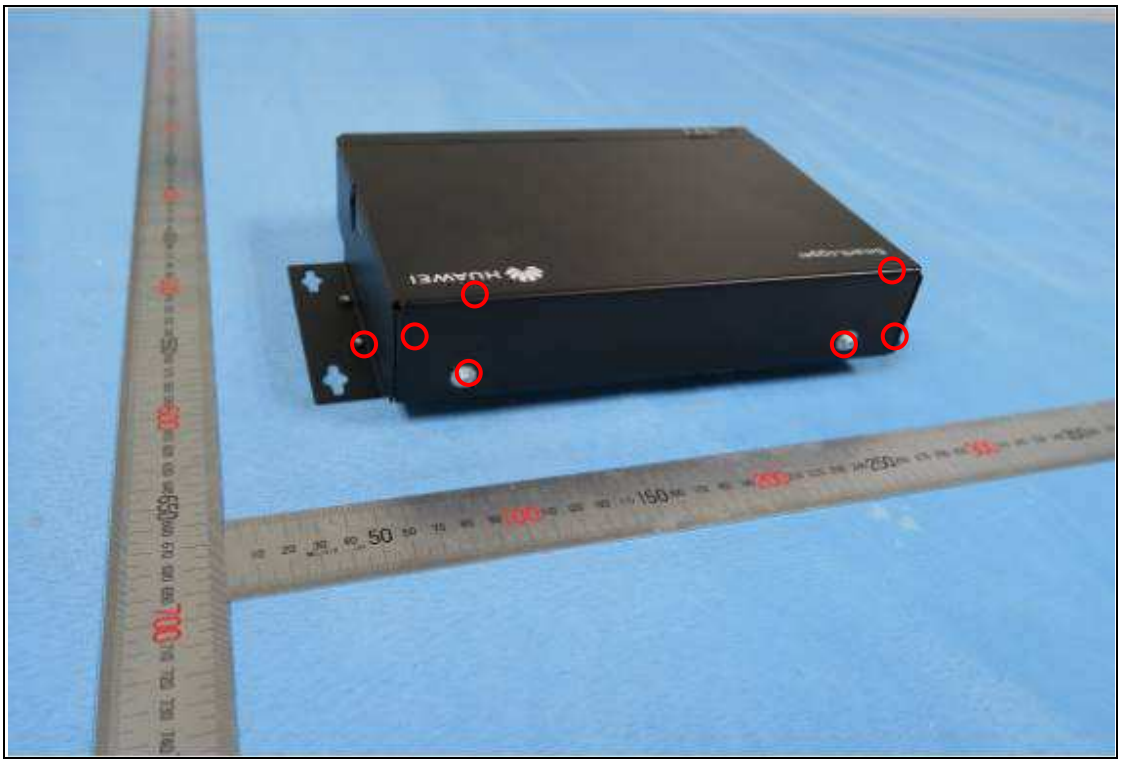
Direct Discharge Application				
Test Level (kV)	**Polarity**	**Test Point**	**Test Result of Contact Discharge**	**Test Result of Air Discharge**
4, 6	+ /-	All metal part	A	N/A
8	+ /-	All non-metal Part	N/A	A

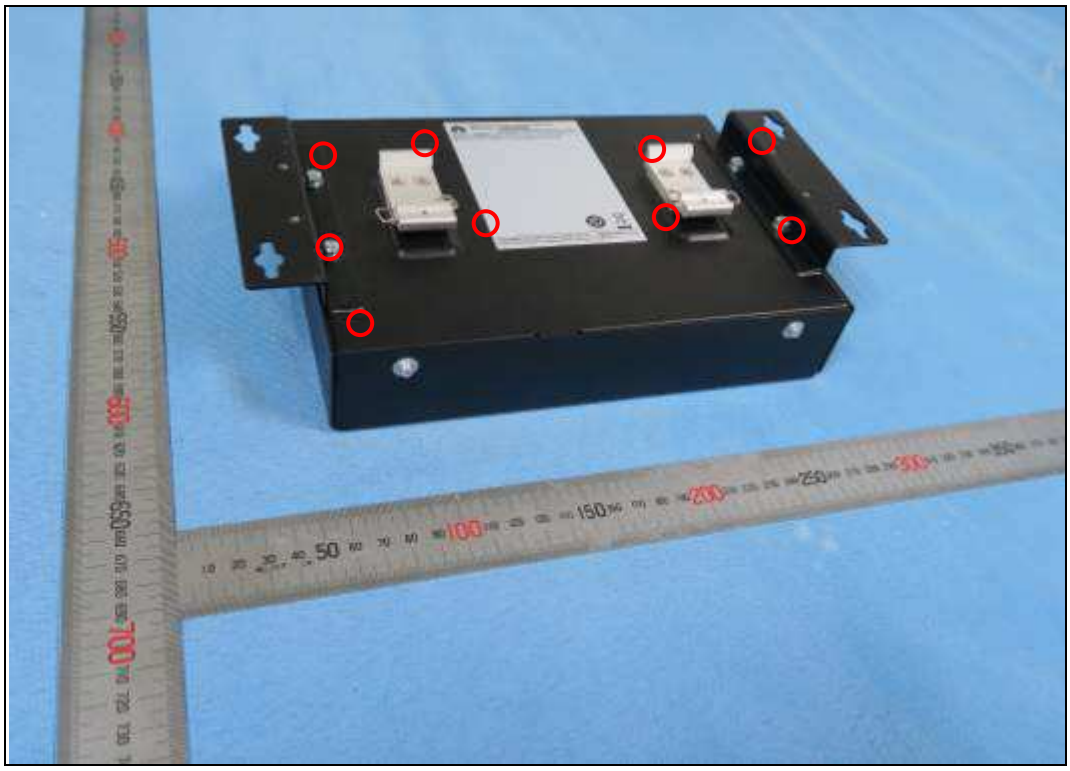
Indirect Discharge Application				
Discharge Level (kV)	**Polarity**	**Test Point**	**Test Result of HCP**	**Test Result of VCP**
4, 6	+ /-	HCP	A	N/A
4, 6	+ /-	VCP	N/A	A

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

ESD TEST POINT
(○ - Direct Contact Discharge; -Air Discharge)








HUAWEI
POWER ADAPTER
MODEL:HW-24-12AC14D
INPUT:100-240V~0.8A 50/60Hz
OUTPUT:12.0V⎓2.0A
Efficiency Level
CAUTION
IS 13252 (Part 1)/
IEC 60950-1
R-41013200
WWW.DLS.GOV.IN

8.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) (EN55035)

8.3.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80-1000MHz,1800MHz, 2600MHz, 3500MHz, 5000MHz
Field Strength:	10 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	at least 3 seconds

8.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	Aglient	SG6000	327339	2019/7/24	2020/7/23
Amplifier	AR	500W1000A	337312	2019/4/23	2020/4/22
Amplifier	AR	175S1G4M3	340318	2019/4/23	2020/4/22
Amplifier	rflight	NTWPAS-4060100	16089043	2019/1/8	2020/1/7
Log-periodic antenna	SCHWARZBECK	STLP 9128D	9128D036	N/A	N/A
Log-periodic antenna	SCHWARZBECK	STLP 9149	9149-121	N/A	N/A
RF TEST SYS CTRLR	AR	SC1000	337402	N/A	N/A

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

8.3.3 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, 1800MHz, 2600MHz, 3500MHz, 5000MHz, 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.

For Broadcast reception function:

f. **Group1:** Equipment in which the desired RF broadcast signal enters the equipment through a coaxial broadcast receiver tuner port. These coaxial ports are intended to be connected via a coaxial cable to an antenna or a cable distribution system.

g. **Group 2:** Broadcast reception equipment which is not included in Group 1.

h. AM/FM/DAB equipment with a coaxial broadcast receiver tuner port is classified as Group 2 equipment if the manufacturer declares that the equipment is not intended to be connected to a CATV or other cable distribution network.

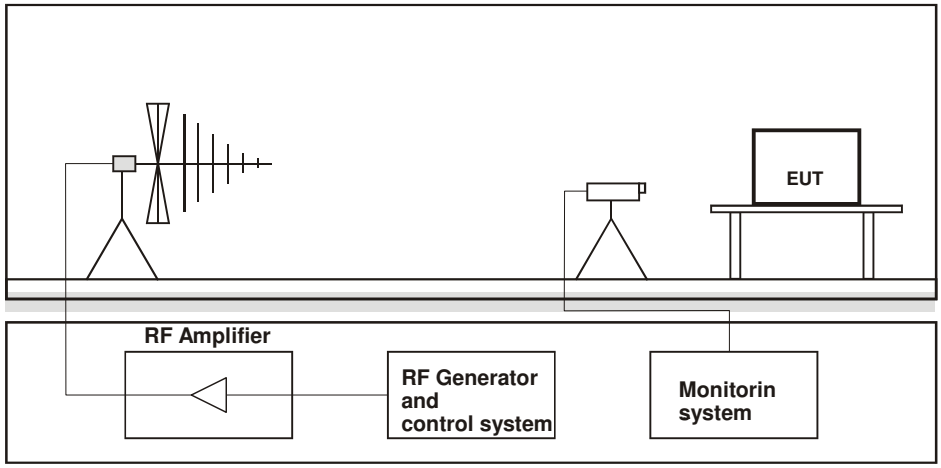
i. The broadcast reception function shall be tested in each reception mode for which the receiver is designed, for example analogue reception, DVB-T, DVB-T2, DVB-C, DVB-C2, DVB-S, DVB-S2. The receiver shall be tuned to one channel and provided with an appropriate wanted signal on that channel or other input typical of normal use.

8.3.4 DEVIATION FROM TEST STANDARD

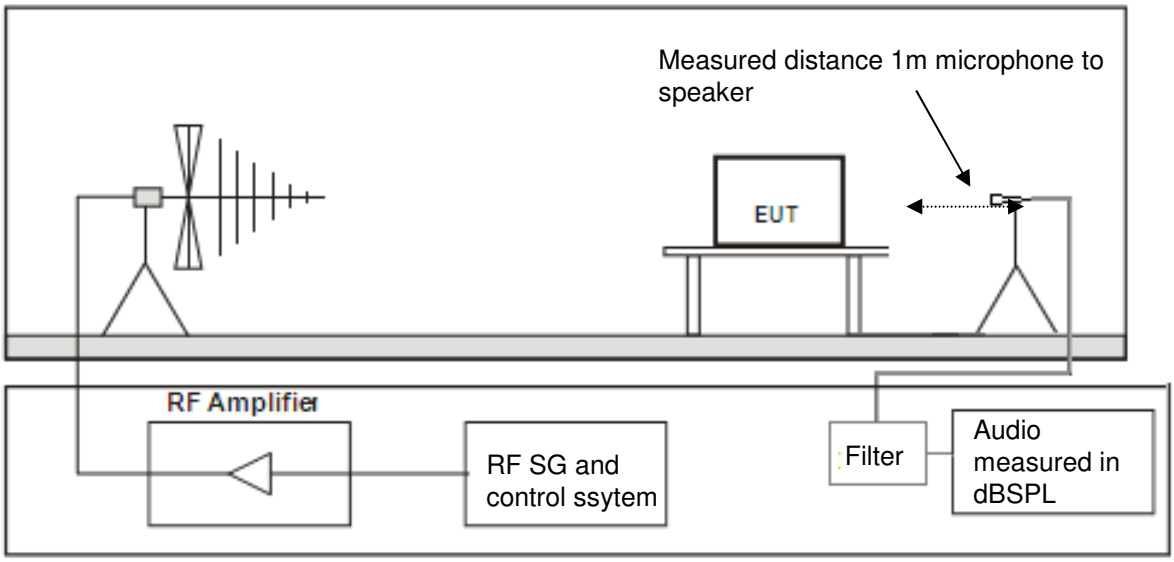
No deviation.

8.3.5 TEST SETUP

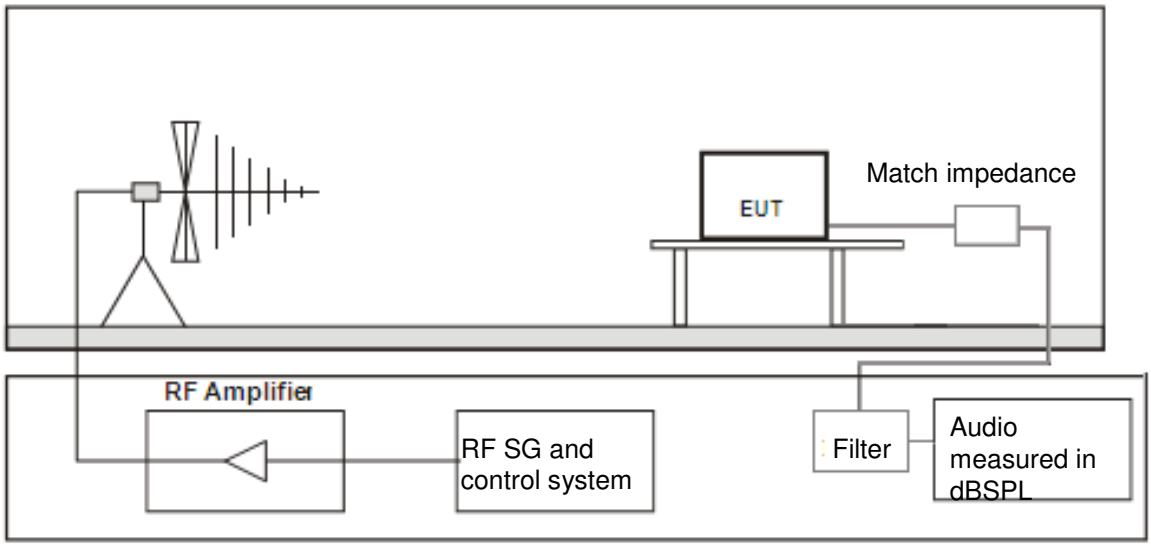
For Picture monitoring:



For Acoustic mode:



For Electrical mode:



NOTE:

1. 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.
2. Filter: 1kHz 3dB band pass filter.
3. The measurement distance: EUT to interference antenna was 3m.

8.3.6 TEST RESULTS

TEST MODE	See section 2.2	**TEST VOLTAGE**	DC 12V From Adapter Input AC 230V/50Hz or DC 24V
ENVIRONMENTAL CONDITIONS	22.6deg., 50.1% RH	**TESTED BY:** Wang Jia	

Field Strength (V/m)	Test Frequency Note (MHz)	Polarization of antenna (Horizontal / Vertical)	Test Distance (m)	Test Result	Remark
10	80-1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz	H&V	3	A	Pass

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

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

8.4.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Frequency Range:	For EN 55024: 80MHz -1000MHz For EN 301 489: 80 MHz ~ 6000 MHz
Field Strength:	10 V/m
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1% of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5 m
Dwell Time:	3 seconds

8.4.2 TEST INSTRUMENT

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	Aglient	SG6000	327339	2019/7/24	2020/7/23
Amplifier	AR	500W1000A	337312	2019/4/23	2020/4/22
Amplifier	AR	175S1G4M3	340318	2019/4/23	2020/4/22
Amplifier	rflight	NTWPAS-4060100	16089043	2019/1/8	2020/1/7
Log-periodic antenna	SCHWARZBECK	STLP 9128D	9128D036	N/A	N/A
Log-periodic antenna	SCHWARZBECK	STLP 9149	9149-121	N/A	N/A
RF TEST SYS CTRLR	AR	SC1000	337402	N/A	N/A

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

8.4.3 TEST PROCEDURE

The test procedure was in accordance with IEC 61000-4-3 for EN 55024

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

b. The frequency range is swept from 80 MHz to 1000 MHz, 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

The test procedure was in accordance with EN 61000-4-3 For EN 301 489.

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

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

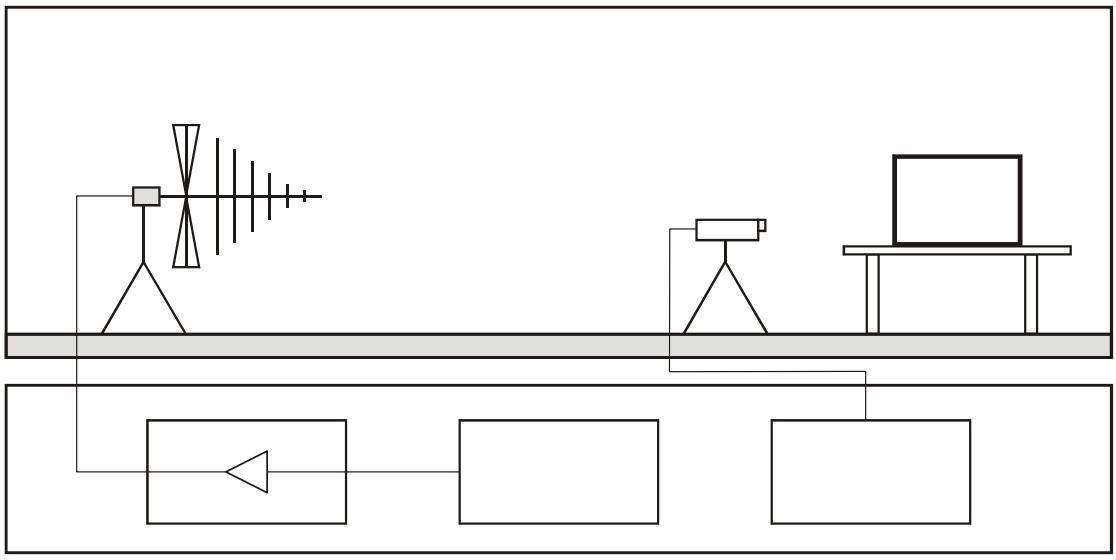
d. The field strength level was 10V/m.

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

8.4.4 DEVIATION FROM TEST STANDARD

No deviation.

8.4.5 TEST SETUP



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

NOTE:
TABLETOP EQUIPMENT
The EUT installed in a representative system as described in section 7 of EN 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.

8.4.6 TEST RESULTS

TEST MODE	See section 2.2	TEST VOLTAGE	DC 12V From Adapter Input AC 230V/50Hz or DC 24V
ENVIRONMENTAL CONDITIONS	23.0deg., 58.0% RH	TESTED BY: Wang Jia	

EN 55024 Standard Requirement					
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	0, 90, 180, 270

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

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

EN 301 489 Standard Requirement					
Field Strength (V/m)	Test Frequency Note#1 (MHz)	Polarization of antenna (Horizontal / Vertical)	Test Distance (m)	Test Result	Remark
10	80 – 6000	H&V	3	A	0, 90, 180, 270

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

Note 1. A: There was no change compared with initial operation during the test.

8.5 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT)

8.5.1 TEST SPECIFICATION

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

8.5.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Fast Transient Burt Simulator	EMTEST	UCS 500 M4	0101-16	2019/1/22	2020/1/21
Coupling Decoupling Network	Teseq	CDN163	160	2019/6/3	2020/6/2
Coupling clamp	SCHAFFNER	CDN8014	31839	2019/6/3	2020/6/2

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.

8.5.3 TEST PROCEDURE

a Both positive and negative polarity discharges were applied.

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

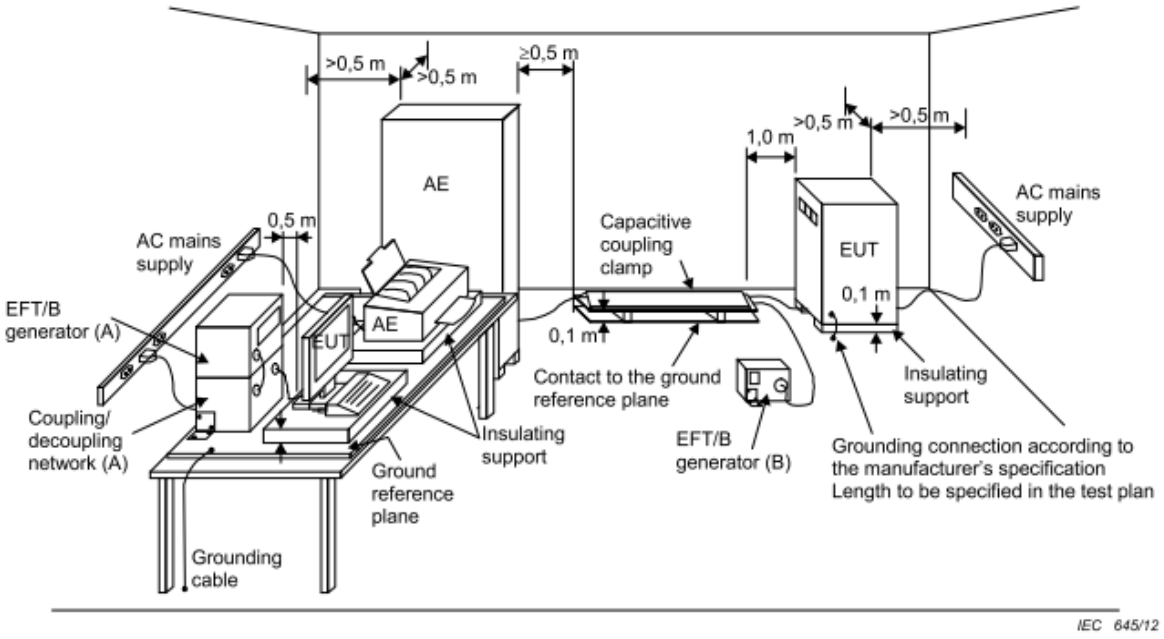
c The duration time of each test sequential was 1 minute.

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

8.5.4 DEVIATION FROM TEST STANDARD

No Deviation.

8.5.5 TEST SETUP



(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.

8.5.6 TEST RESULTS

TEST MODE	See section 2.2	TEST VOLTAGE	DC 12V From Adapter Input AC 230V/50Hz
ENVIRONMENTAL CONDITIONS	25.1deg. C, 60.2% RH	TESTED BY: Wang Jia	

EN 55024 & EN 55035 & EN 301 489:

Pulse Voltage	1 kV		2 kV		___ kV		___ kV	
Pulse Polarity	+	-	+	-	+	-	+	-
L	/	/	A	A	/	/	/	/
N	/	/	A	A	/	/	/	/
PE			A	A				
L+N	/	/	A	A	/	/	/	/
L+PE	/	/	A	A	/	/	/	/
N+PE	/	/	A	A	/	/	/	/
L+N+PE	/	/	A	A	/	/	/	/
L1 (MBUS Port)	/	/	A	A	/	/	/	/
L2 (MBUS Port)	/	/	A	A	/	/	/	/
L3 (MBUS Port)	/	/	A	A	/	/	/	/
L1+L2+L3 (MBUS Port)	/	/	A	A	/	/	/	/
GE Port (RJ45)	A	A	/	/	/	/	/	/
COM Port	A	A	/	/	/	/	/	/
DI	A	A	/	/	/	/	/	/
DO	A	A	/	/	/	/	/	/
AI	A	A	/	/	/	/	/	/
DC + (DC Output)	A	A	/	/	/	/	/	/
DC -(DC Output)	A	A	/	/	/	/	/	/
DC+ + DC- (DC Output)	A	A	/	/	/	/	/	/

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

8.6 SURGE IMMUNITY TEST

8.6.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Signal/telecommunication port(direct to outdoor cables*) 10/700 us Open Circuit Voltage, 5/320 us Short Circuit Current. Combination Wave, Input AC power port: 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	AC Power Line: Line to Line:6kV Line to PE:6kV Signal Line: 1kV,1.5kV, 2kV, 4kV
Surge Input/Output:	L1-L2-L3&L-PE,N-PE, L-N, Signal Line
Polarity:	Positive/Negative
Pulse Repetition Rate:	1 time / 60 sec.
Number of Tests:	5 positive and 5 negative at selected points

* This test is only applicable only to ports, which according to the manufacturer's specification, may connect directly to outdoor cables.

8.6.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
High Energy Pulse Generator	3cTEST	CWS 1000G	ES3521701	2019/1/21	2020/1/20
Coupling Decoupling Network	3cTEST	SPN1550T	ES4221701	2019/1/24	2020/1/23
High energy pulse generator	3cTEST	CWS 1000CT	ES3531801	2019/4/22	2020/4/21
Coupling decoupling network	EMTEST	CNV504 N3.3	V1121109607	2019/7/25	2020/7/24
Coupling decoupling network	HUAWEI	SCN-01	SCN-01005	2019/2/18	2020/2/17
Coupling decoupling network	HUAWEI	SCN-02	SCN-02008	2019/1/24	2020/1/23

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.

8.6.3 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).

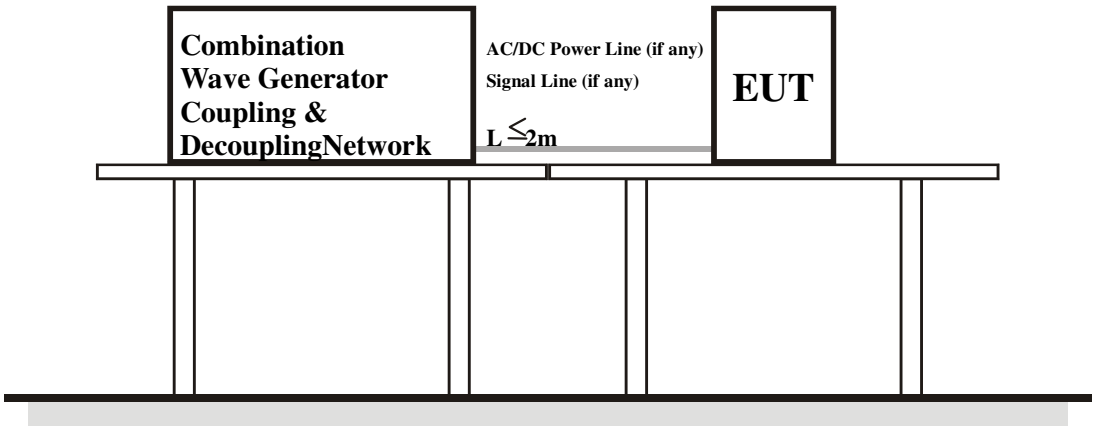
c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

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).

8.6.4 DEVIATION FROM TEST STANDARD

No deviation.

8.6.5 TEST SETUP



8.6.6 TEST RESULTS

TEST MODE	See Section 2.2	TEST VOLTAGE	DC 12V From Adapter Input AC 230V/50Hz
ENVIRONMENTAL CONDITIONS	25.1deg. C, 60.2% RH	TESTED BY: Wang Jia	

EN 55024 & EN 55035 & EN 301 489:

AC/DC Power port & Signal Port (1.2/50)：

\Phase angle \ Test result \Voltage (kV) \ Test point\ Polarity			0°	90°	180°	270°	Test point	Signal Port
6	L1-L2 L1-L3 L2-L3 (MBUS Port)	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
6	L1-N L1-PE L2-PE (MBUS Port)	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
6	L-N L-PE N-PE (AC Mains Port)	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
1	/	+	/	/	/	/	**GE, DI, COM, DO, AI (Line - Line)**	A
		-	/	/	/	/		A
2	/	+	/	/	/	/	**GE, DI, COM, DI, DO, AI (Line - PE)**	A
		-	/	/	/	/		A
2	/	+	/	/	/	/	**DC+ - DC- (DC Output)**	A
		-	/	/	/	/		A
4	/	+	/	/	/	/	**DC+ - PE; DC- - PE (DC Output)**	A
		-	/	/	/	/		A

Signal ports and telecommunication ports (10/700)：

Voltage (kV)	Test Point	Polarity	Test result	Voltage (kV)	Test Point	Polarity	Test result
1.5	GE Port (Line - Line)	+ /-	A	4	DI, COM, DO, AI (Line - Line)	+ /-	A
6	GE Port (Line - PE)	+ /-	A	6	DI, COM, DO, AI (Line - PE)	+ /-	A

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

8.7 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS (CS) (EN 55035)

8.7.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz - 10 MHz, 10 MHz – 30 MHz, 30 MHz – 80MHz
Field Strength:	3 $V_{r.m.s,}$ 3 $V_{r.m.s}$ - 1$V_{r.m.s,}$ 1$V_{r.m.s,}$
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Coupled Cable:	Power Mains, Unshielded
Coupling Device:	CDN-M1, CDN-M2(2 wires), CDN-M3(3 wires), clamp injection, CDN-T4

8.7.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	R&S	SMC100A	102618	2019/1/21	2020/1/20
Amplifier	R&S	BBA100	100984	2019/1/18	2020/1/17
6dB Attenuator	Bird	75-A-FFN-06	1136	2019/1/18	2020/1/17
Coupling Decoupling Network	FCC	FCC-801-M2/ M3	111654	2019/1/22	2020/1/21
Coupling Decoupling Network	FCC	FCC-801-M1-50A	111651	2019/1/22	2020/1/21
Electromagnetic clamp	FCC	F-2031-23mm	111646	2019/2/18	2020/2/17
Coupling decoupling network	Teseq	CDN ST08AS	51382	2019/4/25	2020/4/24

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.

8.7.3 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 0.15 MHz - 10 MHz, 10 MHz – 30 MHz and 30 MHz – 80MHz, 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.

For Broadcast reception function:

g. **Group1:** Equipment in which the desired RF broadcast signal enters the equipment through a coaxial broadcast receiver tuner port. These coaxial ports are intended to be connected via a coaxial cable to an antenna or a cable distribution system.

h. **Group 2:** Broadcast reception equipment which is not included in Group 1.

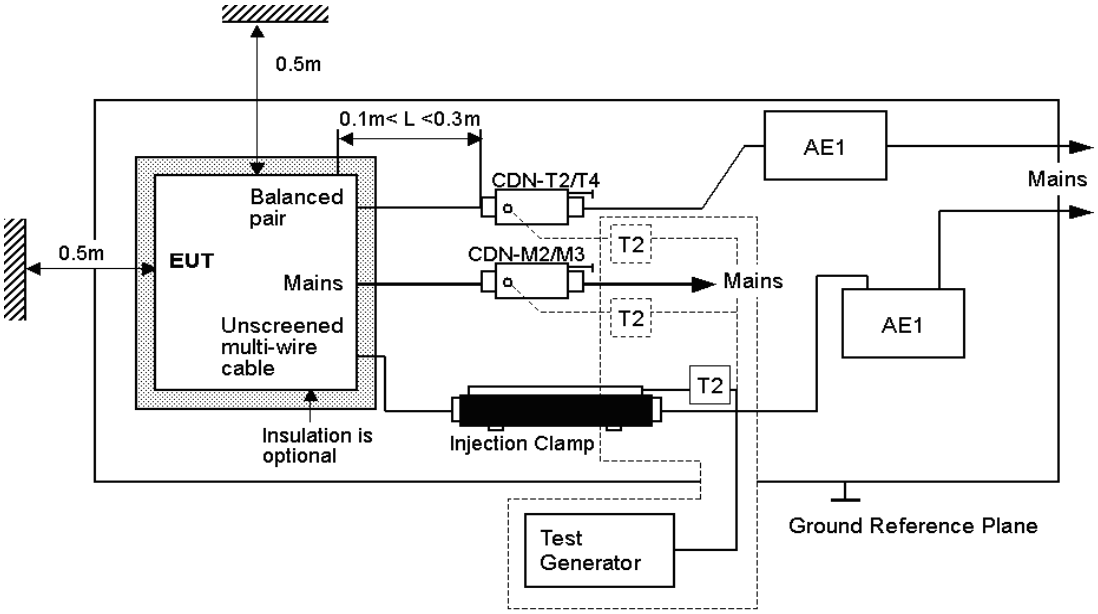
i. AM/FM/DAB equipment with a coaxial broadcast receiver tuner port is classified as Group 2 equipment if the manufacturer declares that the equipment is not intended to be connected to a CATV or other cable distribution network.

j. The broadcast reception function shall be tested in each reception mode for which the receiver is designed, for example analogue reception, DVB-T, DVB-T2, DVB-C, DVB-C2, DVB-S, DVB-S2. The receiver shall be tuned to one channel and provided with an appropriate wanted signal on that channel or other input typical of normal use.

8.7.4 DEVIATION FROM TEST STANDARD

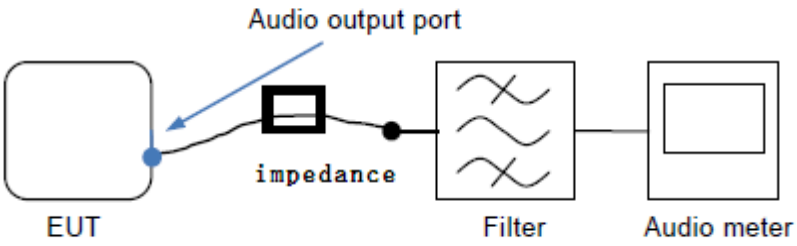
No deviation.

8.7.5 TEST SETUP

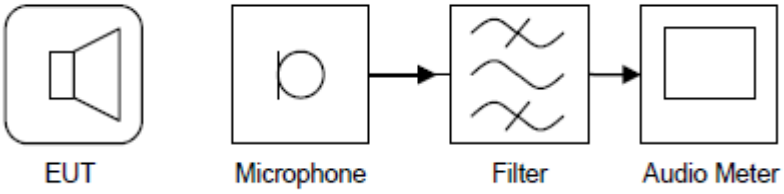


NOTE: The EUT clearance from any metallic obstacles shall be at least 0.5m.
All non-excited input ports of the CDNs shall be terminated by 50Ω loads.

For Electrical measurements setup:



For Acoustic measurements setup:



NOTE:

1. The EUT installed in a representative system 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.
2. Filter: 1kHz 3dB band pass filter.

8.7.6 TEST RESULTS

TEST MODE	See section 2.2	TEST VOLTAGE	DC 12V From Adapter Input AC 230V/50Hz
ENVIRONMENTAL CONDITIONS	22.0deg., 58.0% RH	TESTED BY: Wang	

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 –10 MHz	AC Line	CDN-M3	A	Pass
10	10 –30 MHz	AC Line	CDN-M3	A	Pass
10	30 –80 MHz	AC Line	CDN-M3	A	Pass

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 –10 MHz	PE Line	CND-M1	A	Pass
10	10 –30 MHz	PE Line	CND-M1	A	Pass
10	30 –80 MHz	PE Line	CND-M1	A	Pass

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 –10 MHz	Output Line	CND-M2	A	Pass
10	10 –30 MHz	Output Line	CND-M2	A	Pass
10	30 –80 MHz	Output Line	CND-M2	A	Pass

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 –10 MHz	AI, DI, DO, COM, MBUS Line	clamp injection	A	Pass
10	10 –30 MHz		clamp injection	A	Pass
10	30 –80 MHz		clamp injection	A	Pass

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 –10 MHz	GE (RJ45) Line	CDN-T4	A	Pass
10	10 –30 MHz	GE (RJ45) Line	CDN-T4	A	Pass
10	30 –80 MHz	GE (RJ45) Line	CDN-T4	A	Pass

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

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

8.8 CONDUCTED RADIO FREQUENCY DISTURBANCES (CS) (EN 55024 & EN 301489)

8.8.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-6
Frequency Range:	0.15 MHz ~ 80 MHz
Field Strength:	3 Vrms
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Coupled cable:	Power Mains, Unshielded
Coupling device:	CDN-M1, CDN-M2(2 wires), CDN-M3(3 wires), clamp injection, CDN-T4

8.8.2 TEST INSTRUMENT

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	R&S	SMC100A	102618	2019/1/21	2020/1/20
Amplifier	R&S	BBA100	100984	2019/1/18	2020/1/17
6dB Attenuator	Bird	75-A-FFN-06	1136	2019/1/18	2020/1/17
Coupling Decoupling Network	FCC	FCC-801-M2/ M3	111654	2019/1/22	2020/1/21
Coupling Decoupling Network	FCC	FCC-801-M1-50A	111651	2019/1/22	2020/1/21
Electromagnetic clamp	FCC	F-2031-23mm	111646	2019/2/18	2020/2/17
Coupling decoupling network	Teseq	CDN ST08AS	51382	2019/4/25	2020/4/24

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.

8.8.3 TEST PROCEDURE

a. The test was 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.

b. The frequency range was 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 was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x 10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

c. One of the CDNS not used for injection was terminated with 50 Ω ,providing only one return path. All other CDNs were coupled as doupled networks.

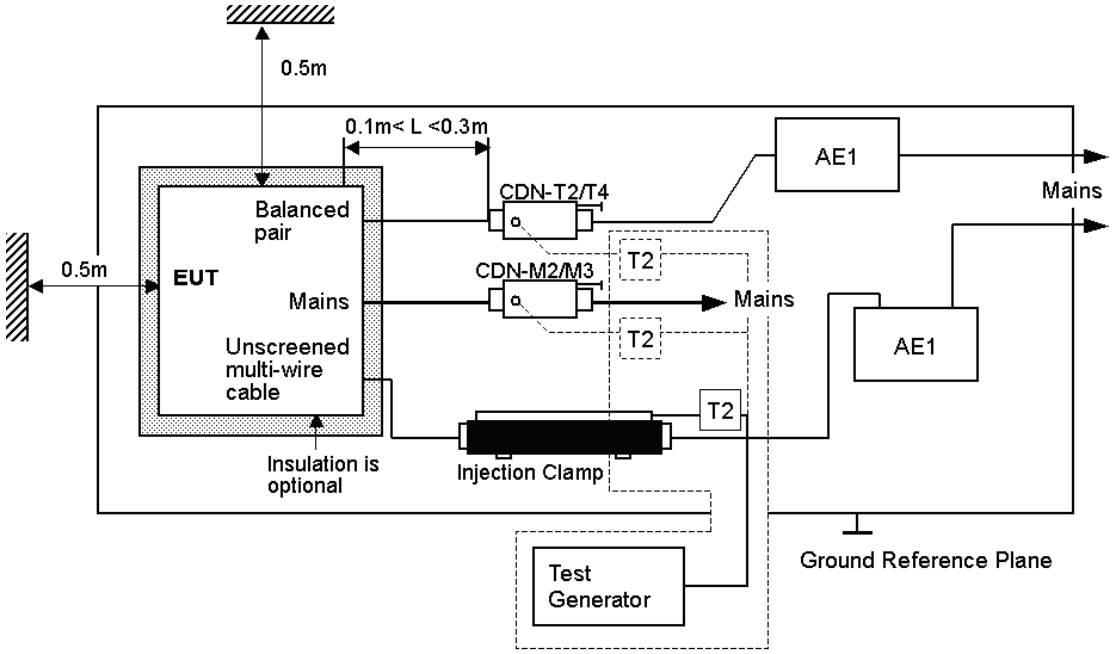
d. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

e. Attempts was made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

8.8.4 DEVIATION FROM TEST STANDARD

No deviation.

8.8.5 TEST SETUP



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

Note: 1. The EUT is setup 0.1 m above Ground Reference Plane.
2. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.

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

NOTE:

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.

8.8.6 TEST RESULTS

TEST MODE	See section 2.2	TEST VOLTAGE	DC 12V From Adapter Input AC 230V/50Hz
ENVIRONMENTAL CONDITIONS	22.0deg., 58.0% RH	TESTED BY: Wang Jia	

EN 55024 & EN 301489:

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 – 80	AC Line	CDN-M3	A	/
10	0.15 – 80	Output Line	CDN-M2	A	/
10	0.15 – 80	PE Line	CDN-M1	A	/
10	0.15 – 80	GE (RJ 45)Line	CDN-T4	A	/
10	0.15 – 80	MBUS, DI, DO, AI, COM Line	Clamp injection	A	/

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

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

8.9 VOLTAGE DIP/SHORT INTERRUPTIONS/VOLTAGE VARIATIONS (DIP) IMMUNITY TEST (EN 55024 & EN 55035)

8.9.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-11
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0° & 180°
Test Cycle:	3 times

8.9.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
AC DIP simulator	Teseq	NSG1007-30	1128A03397	2018/12/7	2019/12/6
Power Source	EMTEST	UCS 500 M4	0101-16	2019/1/22	2020/1/21

NOTE: 1. The test was performed by witness in ShangHai Huawei Technology Co., Ltd.
2. The test was performed in DIPS Room.

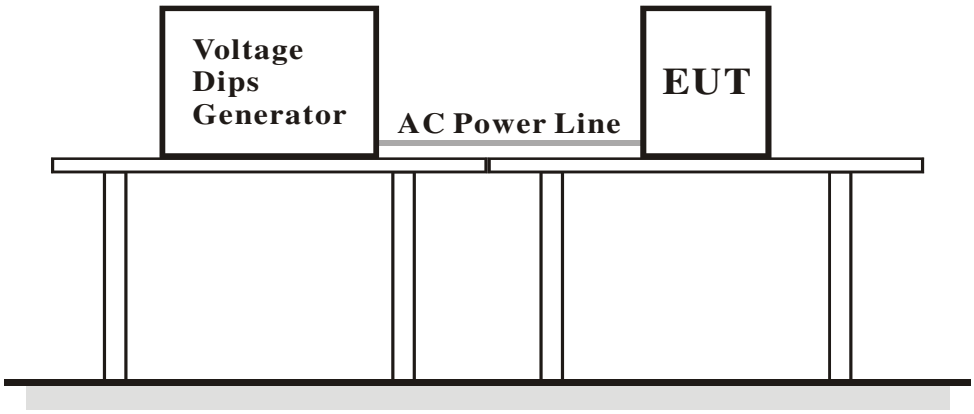
8.9.3 TEST PROCEDURE

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

8.9.4 DEVIATION FROM TEST STANDARD

No deviation.

8.9.5 TEST SETUP



8.9.6 TEST RESULTS

TEST VOLTAGE	AC 100 - 240V 50Hz	ENVIRONMENTAL CONDITIONS	25.5deg. C, 60.2% RH
TESTED BY	Wang Jia	TEST MODE	See section 2.2

Ut : 100 Vac 50 Hz	Durations		Event interval (sec)	Total events (time)	Test result
Voltage dips (%)	(period)	(ms)			
>95	0.5	10	10	3	A
30	25	500	10	3	A
>95	250	5000	10	3	C

Ut : 230 Vac 50 Hz	Durations		Event interval (sec)	Total events (time)	Test result
Voltage dips (%)	(period)	(ms)			
>95	0.5	10	10	3	A
30	25	500	10	3	A
>95	250	5000	10	3	C

Ut : 240 Vac 50 Hz	Durations		Event interval (sec)	Total events (time)	Test result
Voltage dips (%)	(period)	(ms)			
>95	0.5	10	10	3	A
30	25	500	10	3	A
>95	250	5000	10	3	C

NOTE: A: There was no change compared with initial operation during the test.
B: The EUT stopped operation when at the 100% voltage interruption, but it can recover by itself.

8.10 VOLTAGE DIP/SHORT INTERRUPTIONS/VOLTAGE VARIATIONS (DIPS) IMMUNITY TEST (EN301 489)

8.10.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-11
Test Levels:	Voltage Dips: i) 0% residual for 0.5 cycle ii) 0% residual for 1 cycle iii) 70% residual for 25 cycle Voltage Interruptions: iv) 0% residual for 250 cycle
Test Duration Time:	3 test events in sequence
Interval between Event:	10 seconds
Phase Angle:	0°/180°

8.10.2 TEST INSTRUMENT

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
AC DIP simulator	Teseq	NSG1007-30	1128A03397	2018/12/7	2019/12/6
Power Source	EMTEST	UCS 500 M4	0101-16	2019/1/22	2020/1/21

NOTE: 1. The test was performed by witness in Shanghai Testing & Inspection Institute for Electrical Equipment.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

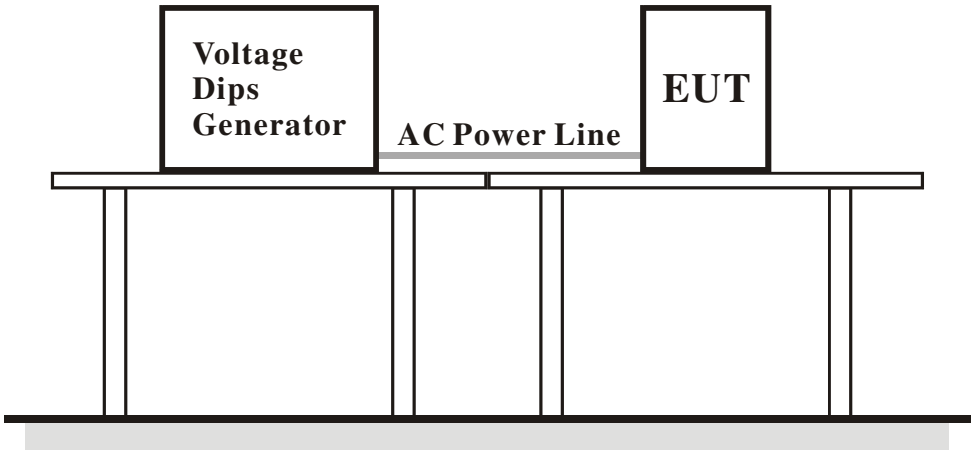
8.10.3 TEST PROCEDURE

The EUT was tested for each selected combination of test levels and duration with a sequence of 3 dips/interruptions with intervals of 10s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

8.10.4 DEVIATION FROM TEST STANDARD

No deviation.

8.10.5 TEST SETUP



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

8.10.6 TEST RESULTS

TEST VOLTAGE	AC 100 - 240V 50Hz	ENVIRONMENTAL CONDITIONS	25.5deg. C, 60.2% RH
TESTED BY	Wang Jia	TEST MODE	See section 2.2

Ut : 100 Vac 50 Hz	Durations		Event interval (sec)	Total events (time)	Test result
Voltage dips (%)	(period)	(ms)			
0	0.5	10	10	3	A
0	1	20	10	3	A
70	25	500	10	3	A
0	250	5000	10	3	C

Ut : 230 Vac 50 Hz	Durations		Event interval (sec)	Total events (time)	Test result
Voltage dips (%)	(period)	(ms)			
0	0.5	10	10	3	A
0	1	20	10	3	A
70	25	500	10	3	A
0	250	5000	10	3	C

Ut : 240 Vac 50 Hz	Durations		Event interval (sec)	Total events (time)	Test result
Voltage dips (%)	(period)	(ms)			
0	0.5	10	10	3	A
0	1	20	10	3	A
70	25	500	10	3	A
0	250	5000	10	3	C

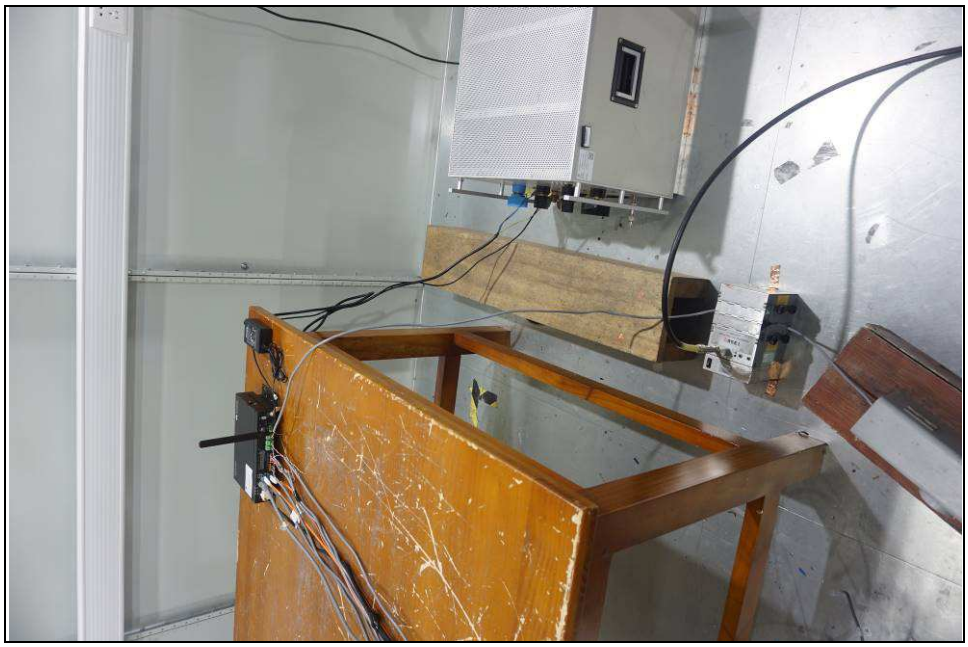
NOTE: A: There was no change compared with initial operation during the test.
B: The EUT stopped operation when at the 100% voltage interruption, but it can recover by itself.

9 PHOTOGRAPHS OF THE TEST CONFIGURATION

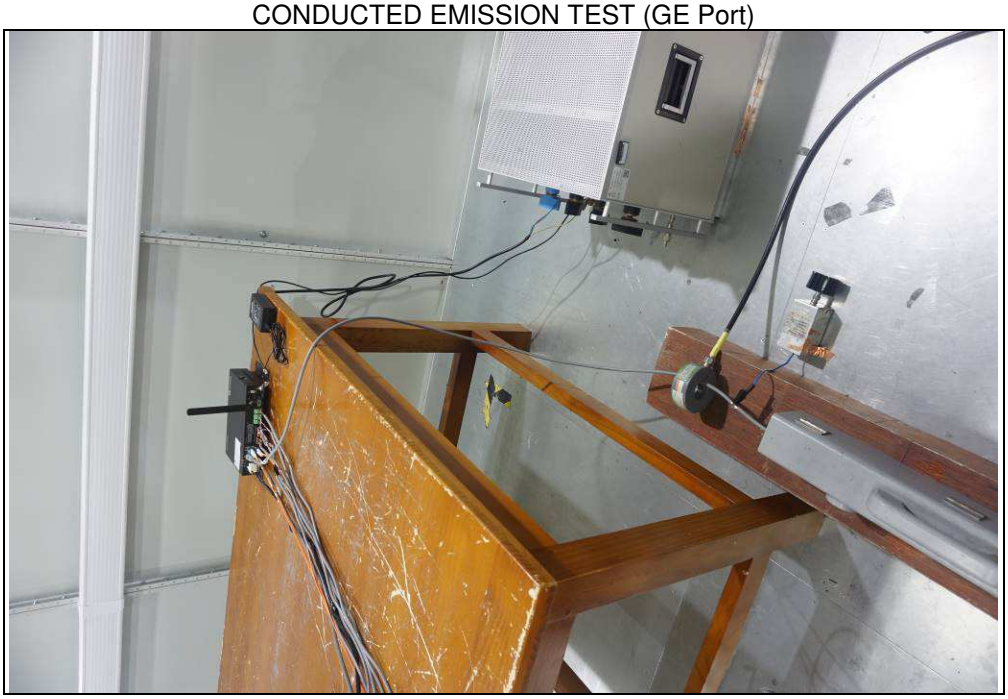
CONDUCTED EMISSION TEST (AC Power Port)

CONDUCTED EMISSION TEST (MBUS Port)

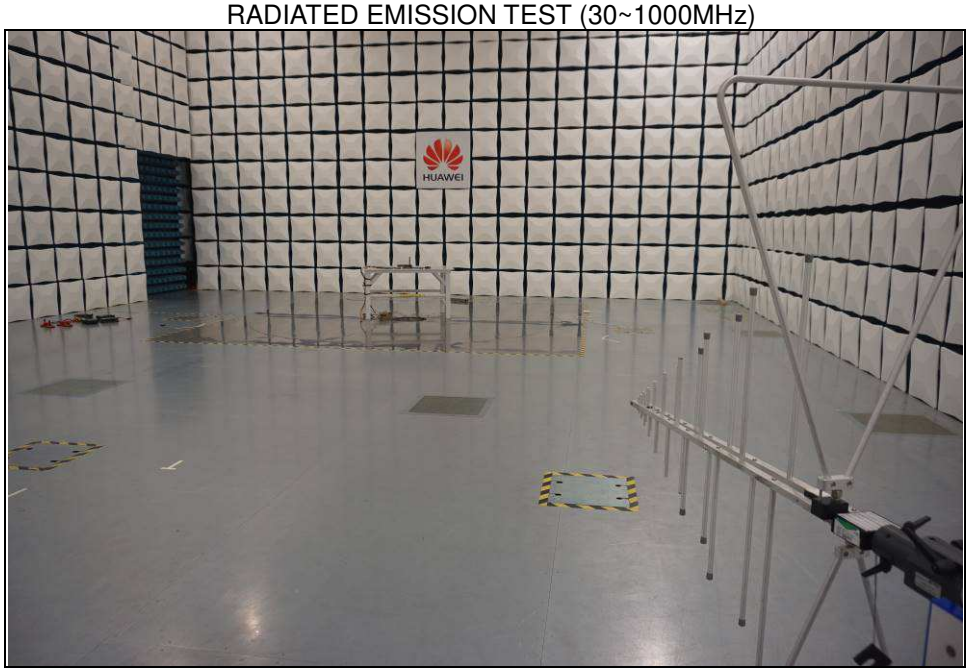
CONDUCTED EMISSION TEST (Telecom port-RS485)



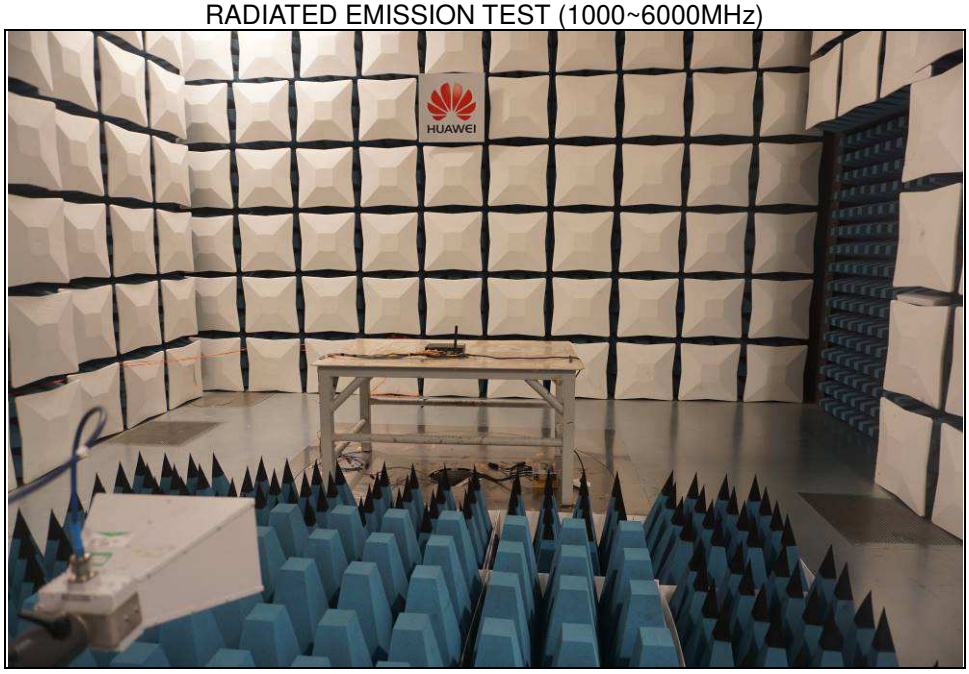
CONDUCTED EMISSION TEST (GE Port)



RADIATED EMISSION TEST (30~1000MHz)

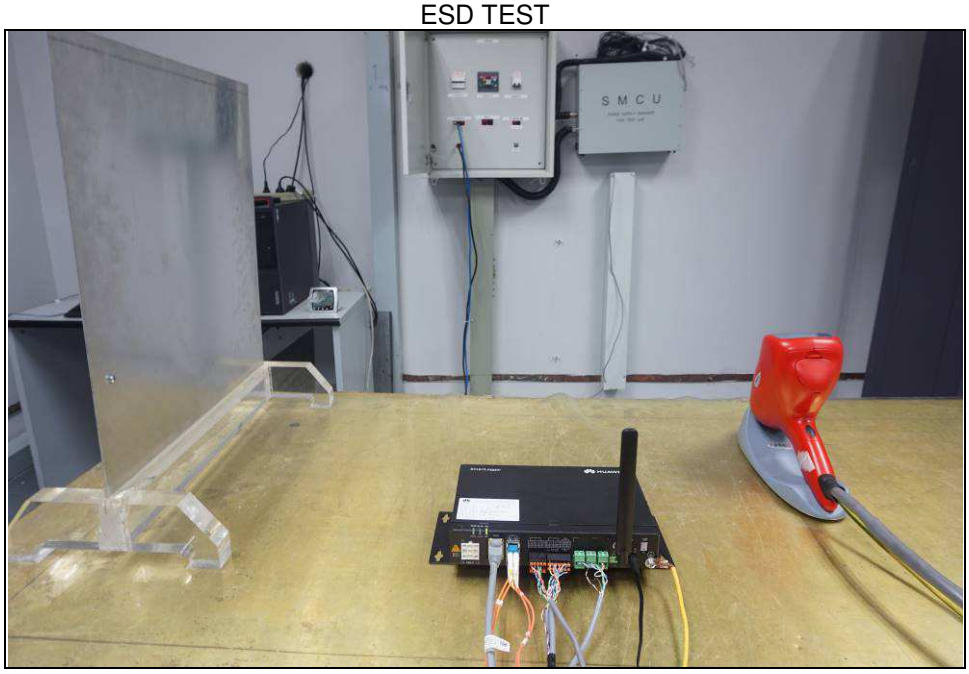


RADIATED EMISSION TEST (1000~6000MHz)

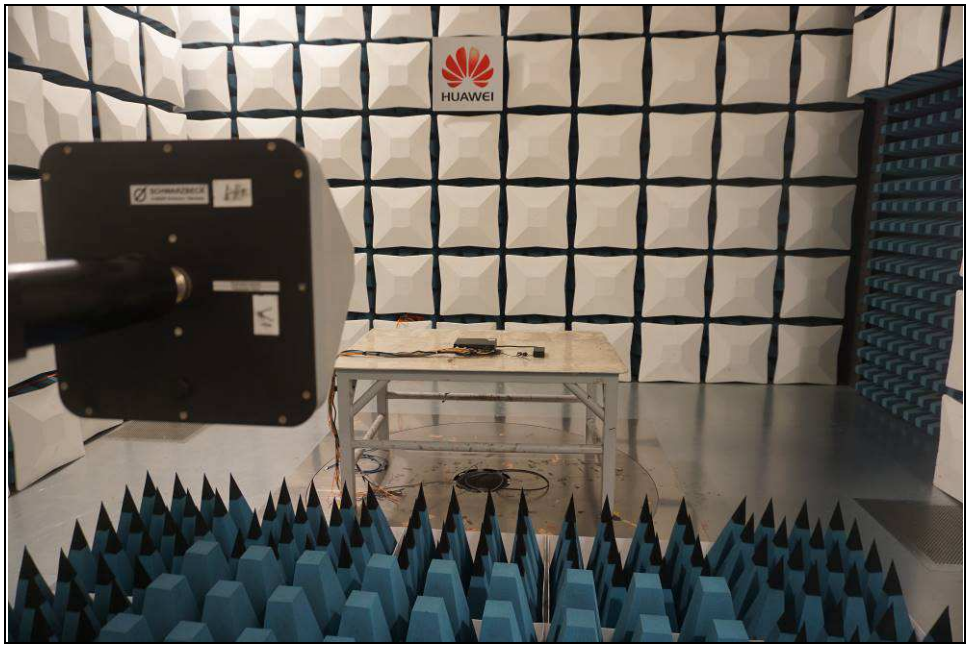


HARMONICS EMISSION TEST &
VOLTAGE FLUCTUATIONS AND FLICKER TEST

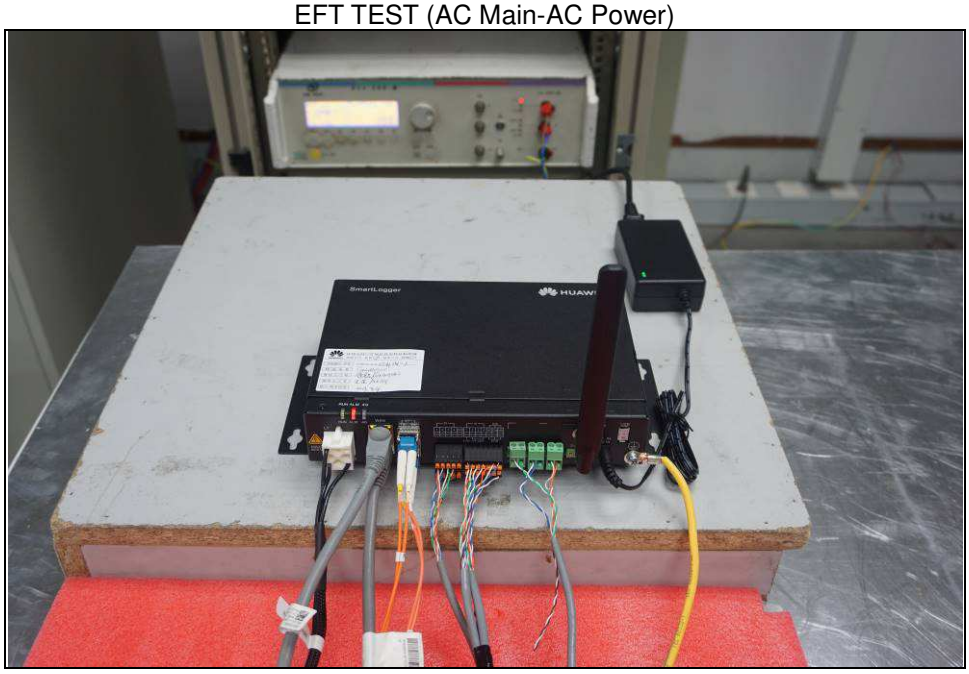
ESD TEST



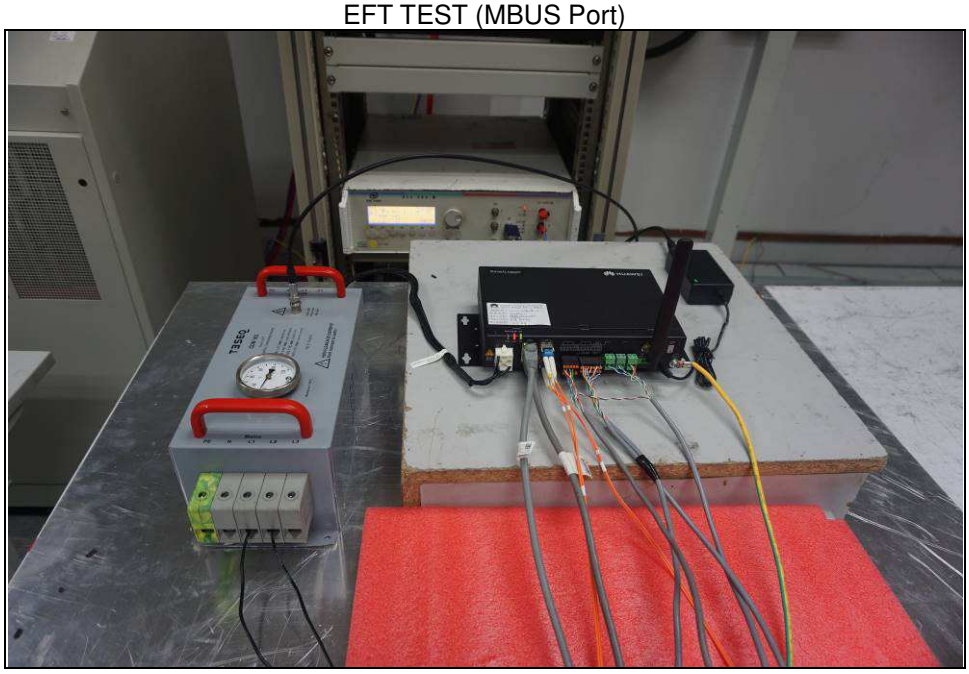
RS TEST



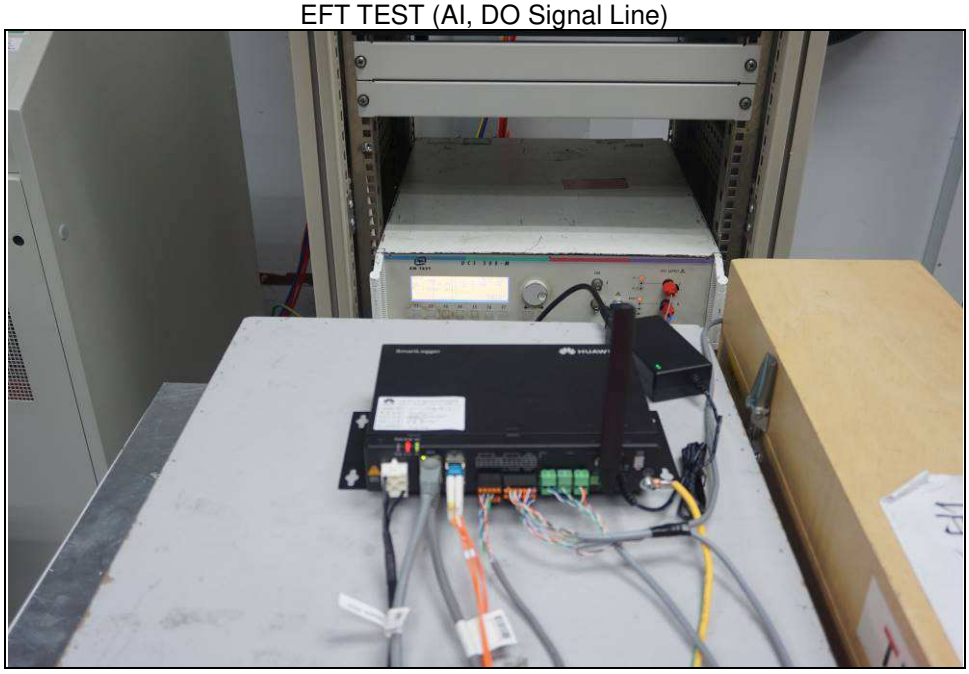
EFT TEST (AC Main-AC Power)



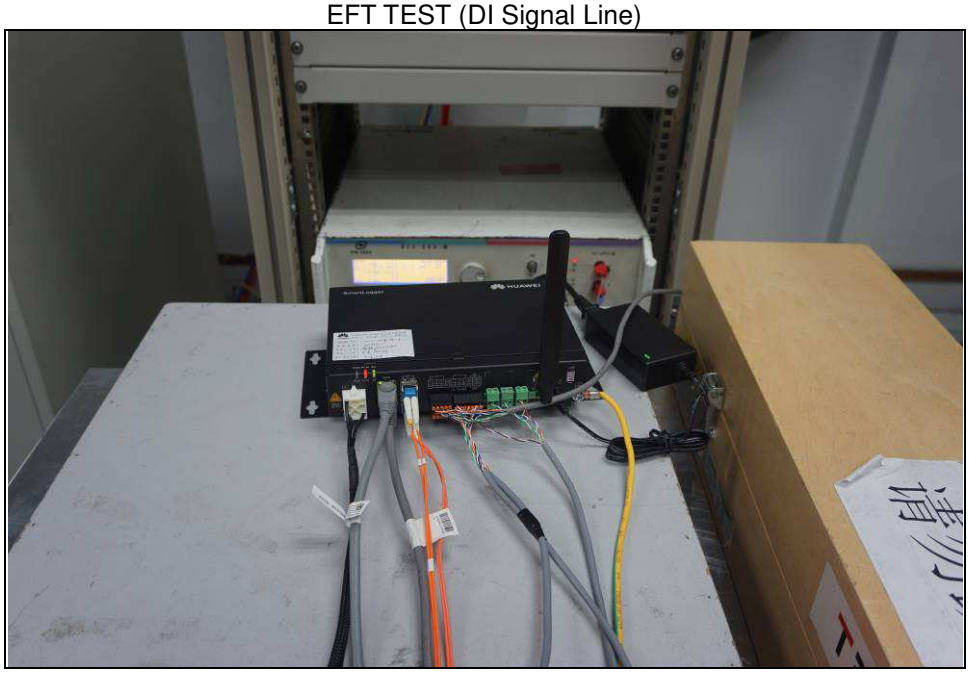
EFT TEST (MBUS Port)



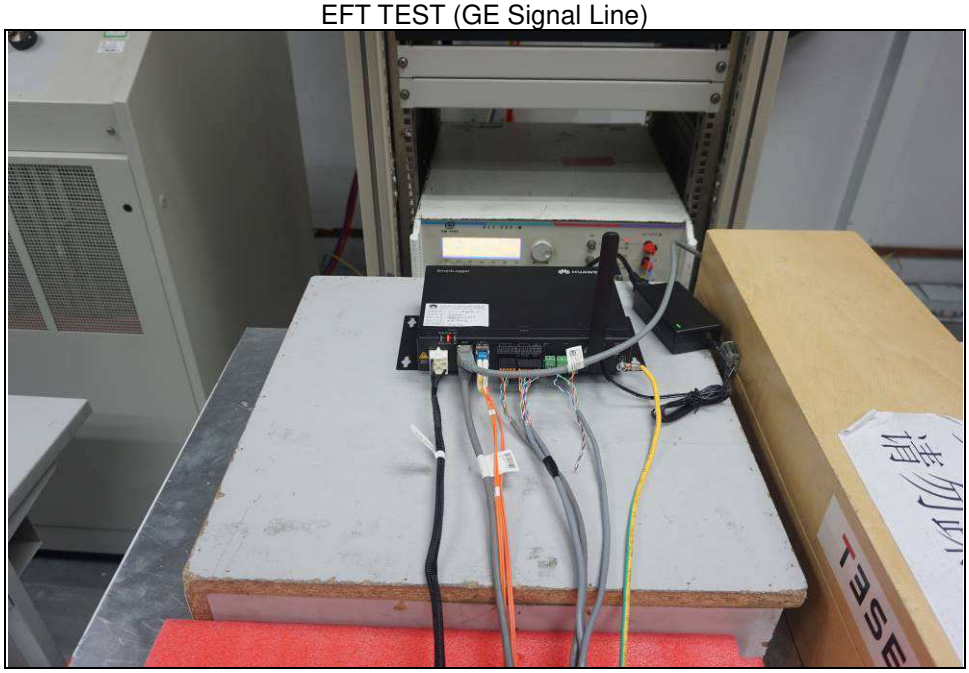
EFT TEST (AI, DO Signal Line)



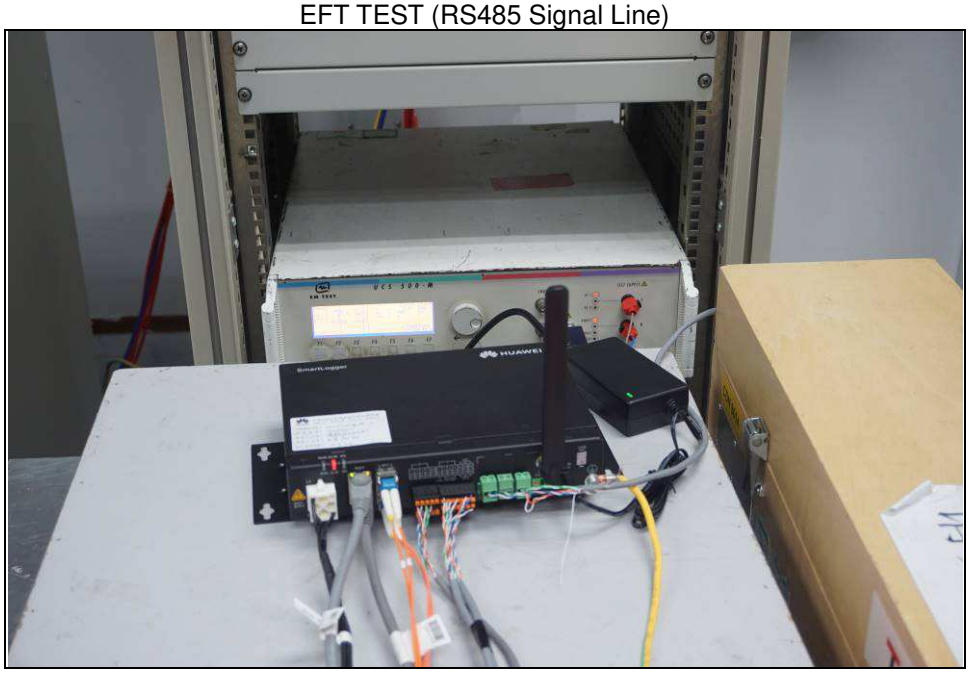
EFT TEST (DI Signal Line)



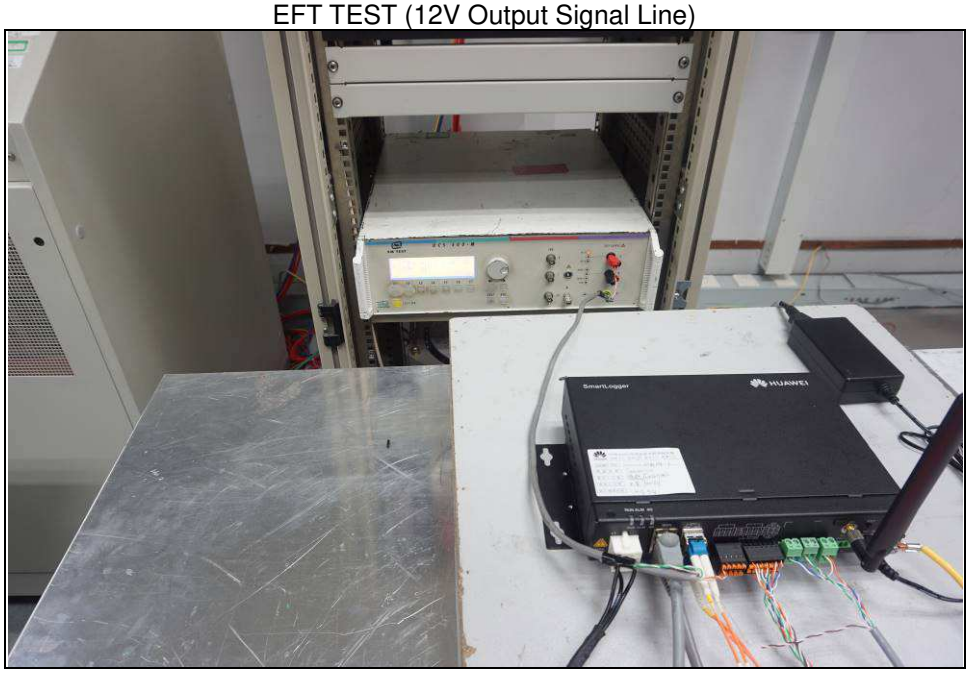
EFT TEST (GE Signal Line)



EFT TEST (RS485 Signal Line)

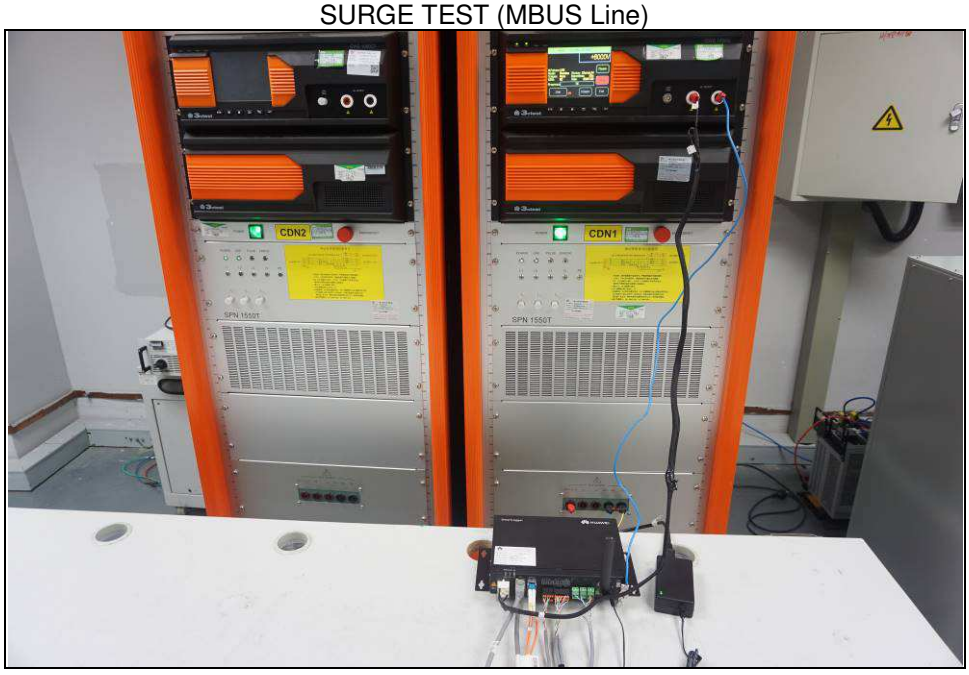


EFT TEST (12V Output Signal Line)

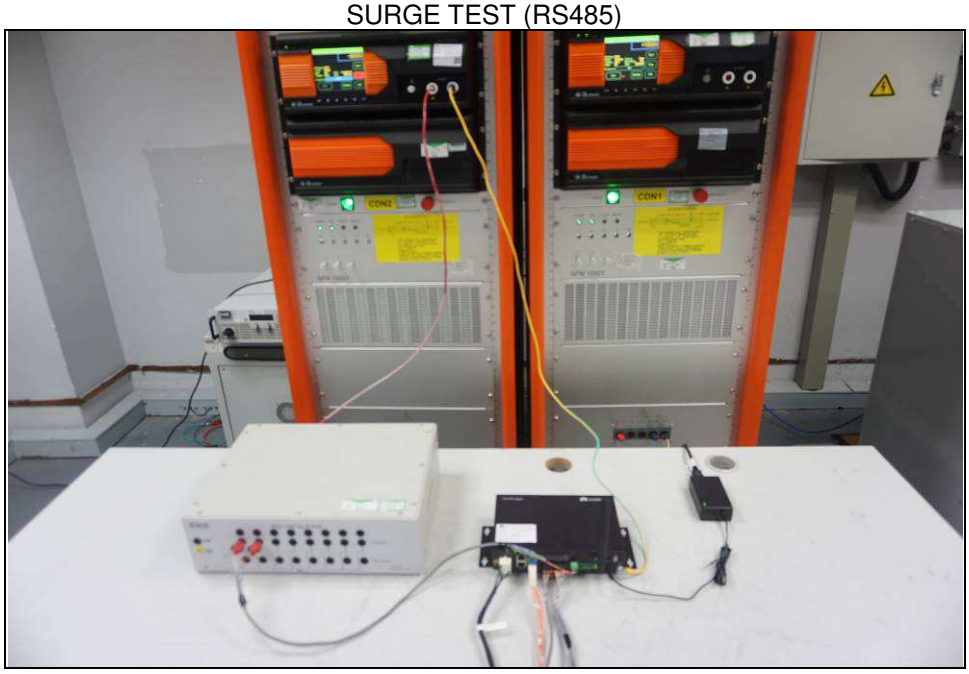


SURGE TEST (AC Line)

SURGE TEST (MBUS Line)

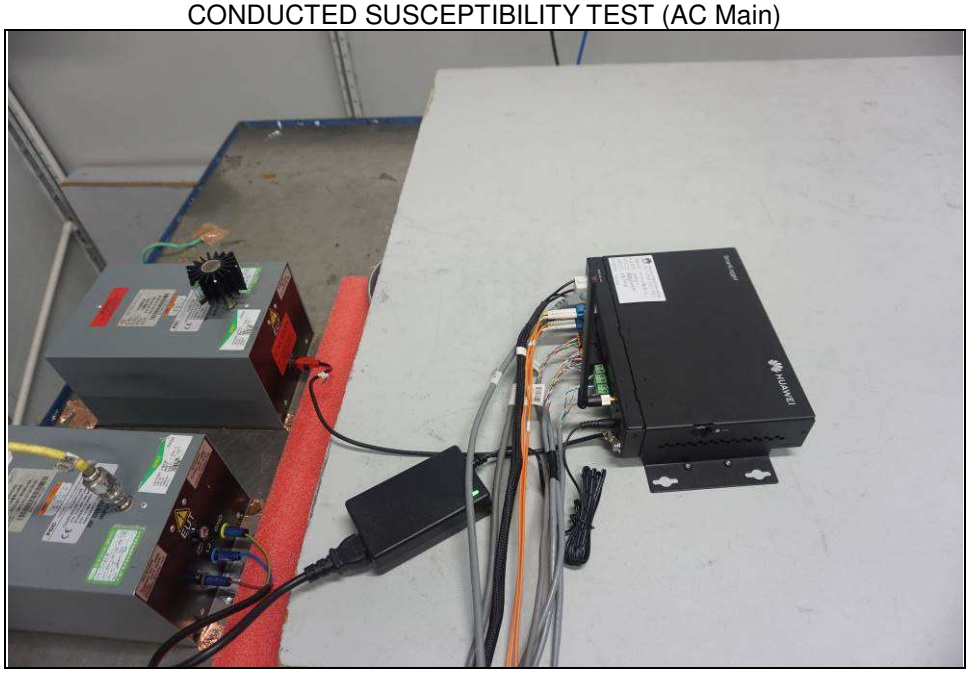


SURGE TEST (RS485)



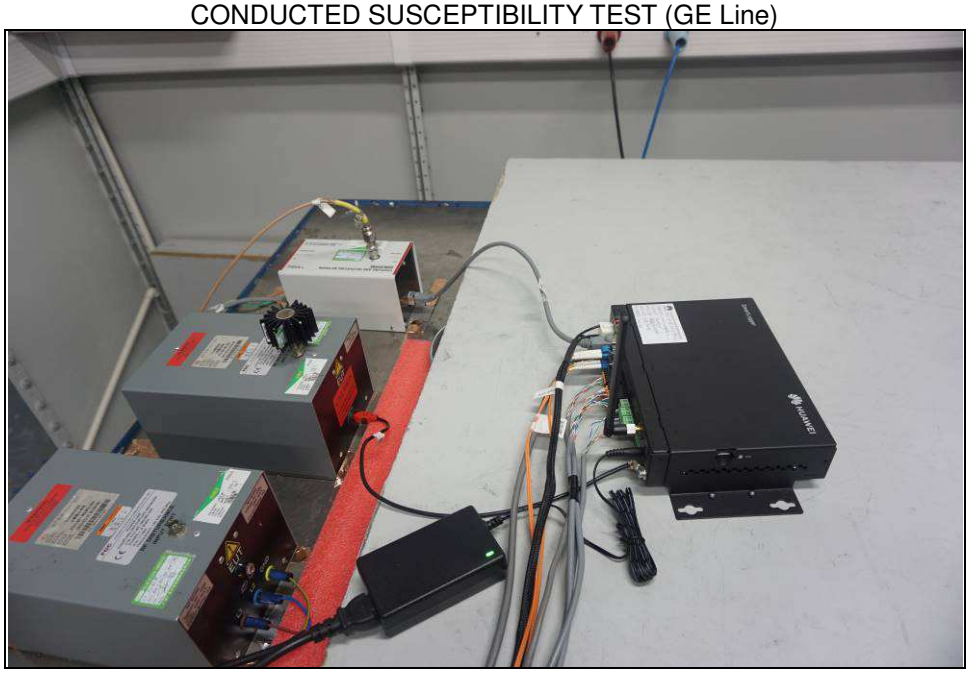
SURGE TEST (Signal Line)

CONDUCTED SUSCEPTIBILITY TEST (AC Main)

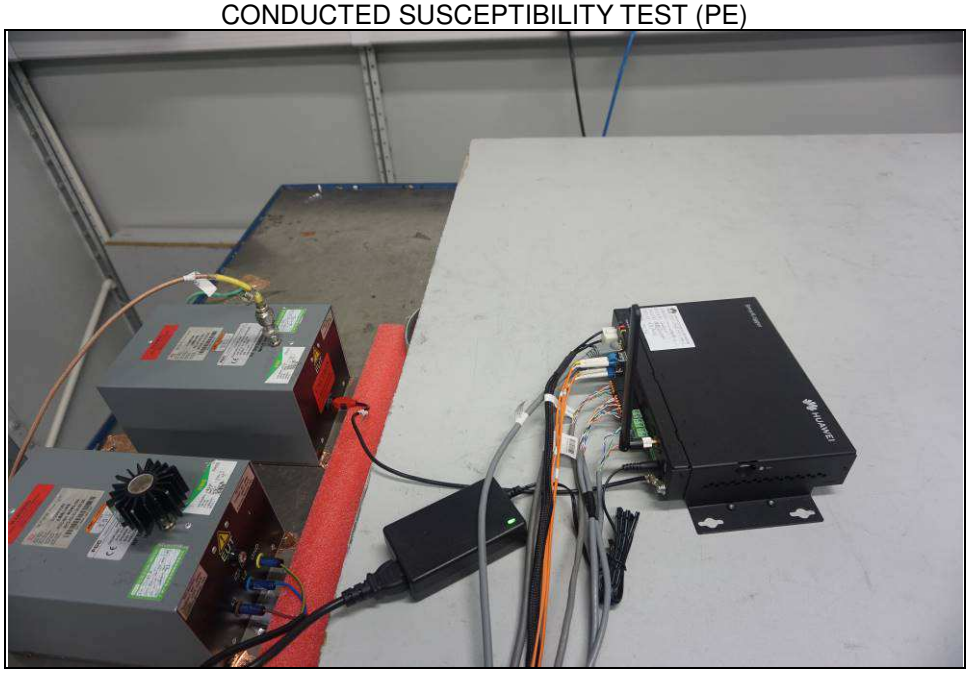


CONDUCTED SUSCEPTIBILITY TEST (MBUS Line)

CONDUCTED SUSCEPTIBILITY TEST (GE Line)



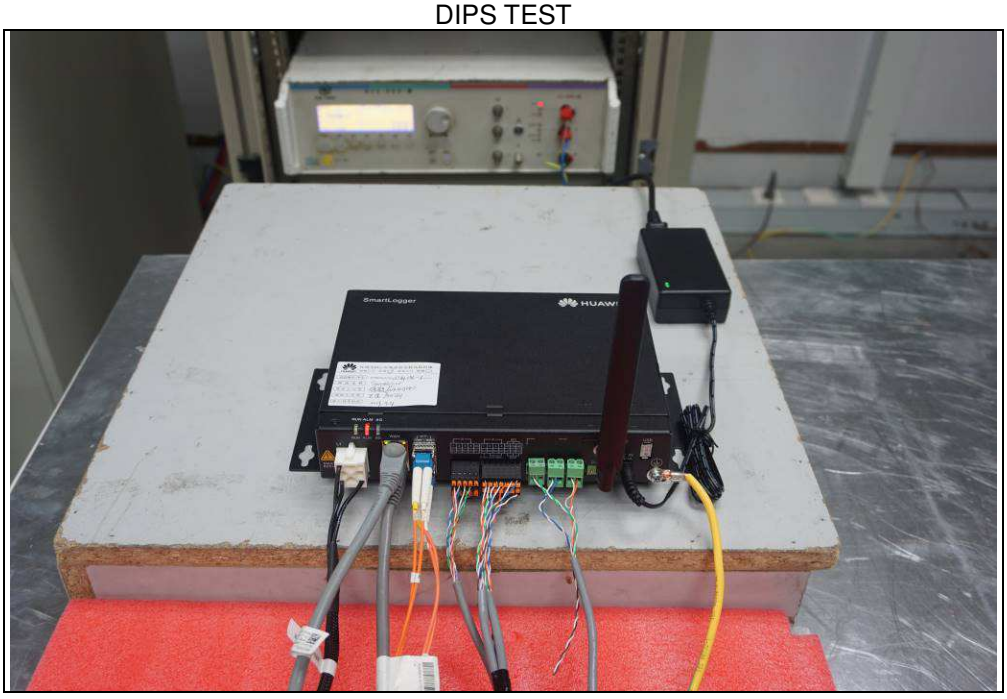
CONDUCTED SUSCEPTIBILITY TEST (PE)



CONDUCTED SUSCEPTIBILITY TEST (RS485 Line)

CONDUCTED SUSCEPTIBILITY TEST (12V Output Line)

DIPS TEST



10 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---