EMC Test Report

Applicant: Suzhou Hypontech Co., Ltd.

Address: No.1508 Xiangjiang Road, SND, 215010
Suzhou PEOPLE'S REPUBLIC OF CHINA

Product: Converter (Micro inverter)

Model: HMS-600W, HMS-600W-C, HMS-800W, HMS-800W-C

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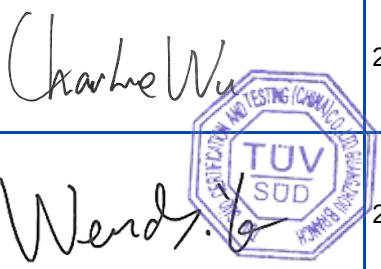
Add value.
Inspire trust.

COMMERCIAL-IN-CONFIDENCE

Report Number: 64.972.23.30372.01

RESPONSIBLE FOR	NAME	SIGNATURE	DATE
Prepared by	Charlie Wu		2023-04-17
Approved by	Wendy Ye		2023-04-17

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service control rules.

EXECUTIVE SUMMARY This product was tested and found to be in compliance with	EN IEC 61000-6-1:2019 EN IEC 61000-6-3:2021 EN 62920:2017/A1:2021 EN 301 489-1 V2.2.3:2019 EN 301 489-17 V3.2.4:2020

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	2023-04-17

1.2 Introduction

The information contained in this report is intended to show verification of the EMC Qualification Approval Testing of the requirements of the standards for the tests listed in Section 1.3.

Applicant	:	Suzhou Hypontech Co., Ltd.
Address	:	No.1508 Xiangjiang Road, SND, 215010 Suzhou PEOPLE'S REPUBLIC OF CHINA
Manufacturer	:	Same as applicant
Address	:	Same as applicant
Model Number(s)	:	HMS-600W, HMS-600W-C, HMS-800W, HMS-800W-C
Product Type	:	Grid-Connected PV Inverter
Trademark	:	N/A
Date of Receipt of EUT	:	2023-03-20
Start of Test	:	2023-03-21
Finish of Test	:	2023-03-21
Name of Engineer(s)	:	Charlie Wu

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1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with EN IEC 61000-6-1:2019, EN IEC 61000-6-3:2021, EN 62920:2017/A1:2021, EN 301 489-1 V2.2.3:2019, EN 301 489-17 V3.2.4:2020 are shown below.

Specification	Clause	Test Description	Result	Remark
EN IEC 61000-6-3:2021	11	Conducted disturbance at mains terminals	Pass	/
EN 62920:2017/A1:2021	8		Pass	/
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	8.4 of EN 301 489-1	Conducted Disturbance at AC input/output port	Pass	/
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	8.3 of EN 301 489-1	Conducted Disturbance at DC input/output port	N/A	Note 2
EN IEC 61000-6-3:2021	11	Conducted disturbance at DC power port	Pass	/
EN 62920:2017/A1:2021	8		Pass	/
EN IEC 61000-6-3:2021	11	Radiated disturbance	Pass	/
EN 62920:2017/A1:2021	8			/
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	8.2 of EN 301 489-1			/
EN 61000-3-12:2011	11	Harmonic current emission	N/A	Note 5
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	8.5 of EN 301 489-1		N/A	Note 5
EN IEC 61000-3-11:2019	11	Flicker	N/A	Note 5
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	8.6 of EN 301 489-1		N/A	Note 5
EN IEC 61000-6-1:2019 EN 62920:2017/A1:2021 (refer IEC 61000-4-2:2008)	9	Electrostatic discharge immunity test	Pass	/
				/
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	9.3 of EN 301 489-1			/
EN IEC 61000-6-1:2019 EN 62920:2017/A1:2021 (refer IEC 61000-4-4:2012)	9	Electrical fast transient /burst immunity test	Pass	/
				/
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	9.4 of EN 301 489-1		Pass	/
EN IEC 61000-6-1:2019 EN 62920:2017/A1:2021 (refer IEC 61000-4-3:2006+AMD1:2007+AMD2:2010)	9	Radiated, radio-frequency, electromagnetic field immunity test	Pass	/
				/
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	9.2 of EN 301 489-1		Pass	/
EN IEC 61000-6-1:2019 EN 62920:2017/A1:2021 (refer IEC 61000-4-5:2014)	9	Surge immunity test	Pass	/
				Note 3

Specification	Clause	Test Description	Result	Remark
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	9.8 of EN 301 489-1		Pass	/
EN IEC 61000-6-1:2019 EN 62920:2017/A1:2021 (refer IEC 61000-4-6:2013)	9	Immunity to conducted disturbances, induced by radio-frequency fields	Pass	/ /
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	9.5 of EN 301 489-1		Pass	/
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	9.6 of EN 301 489-1	Vehicular transient and surges****	N/A	/
EN IEC 61000-6-1:2019 EN 62920:2017/A1:2021 (refer IEC 61000-4-8:2009)	9	Immunity – Enclosure port – Power-frequency magnetic field	Pass	/
EN IEC 61000-6-1:2019 EN 62920:2017/A1:2021 (refer IEC 61000-4-11:2004)	9	Voltage dips, short interruptions and voltage variations immunity tests	Pass	/ /
EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4	9.7 of EN 301 489-1		Pass	/

Remark:
Note 1: The highest internal frequency of the EUT is less than 108 MHz, the measurement was made up to 1GHz.
Note 2: No tests are required for dc powered equipment with an overall length power line less than 3m.
Note 3: The length of dc cord is shorter than 30m as the manufacturer`s declared.
Note 4: Equipment containing no Hall elements or magnetic field sensors is not susceptible to magnetic field. Hence, this equipment is deemed to fulfil the magnetic field test.
Note 5: Not application to the equipment which intended to be not connected to public low-voltage distribution systems for input port.

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1.4 Test Conditions

1.4.1 Environmental Conditions

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:		
Temperature	**Humidity**	**Atmospheric pressure**
15 °C – 35 °C	30 % - 60 %	800 hPa – 1060 hPa
If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.		

1.4.2 Performance Criteria

For EN IEC 61000-6-2:2019
Performance criterion A: The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. 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 from what the user may reasonable expect from the apparatus if used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however no change of actual operating state or stored data is allowed to persist after 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 from what the user may reasonable expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instruction for use.

Clause 6 of EN301 489-1		
Criteria	**Performance Criteria**	
CT/CR	During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended.	
TT/TR	After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended.	
Clause 6 of EN301 489-17		
Criteria	**During test**	**After test**
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function.

	Shall be no unintentional transmissions.	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 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). 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 2).
NOTE 1: 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 2: 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. NOTE 3:Performance criteria A for immunity tests with phenomena of a continuous nature; The performance criteria B for tests with phenomena of a continuous nature, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration or which performance criteria C shall apply.		

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1.5 Product Information and general remarks

1.5.1 Technical Description

Ratings : Refer to the section 1.5.4

Protection class : I

1.5.2 Test Configuration

Configuration	Description
AC Powered	AC 230V, 50Hz
DC Powered	DC 60V

1.5.3 Modes of Operation

Mode	Description
Test mode 1:TM1	PV to Grid with full load + WIFI/BLE connection mode
Test mode 2:TM2	PV to Grid with half load + WIFI/BLE connection mode
Test mode 3:TM3	PV to Grid with null load + WIFI/BLE connection mode

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1.5.4 General remark:

All models have the same electronic components except amount of AC output port and output power/current by software control.
Models HMS-800W, HMS-600W have two output ports and models HMS-800W-C, HMS-600W-C only have one output port.
By evaluation, model HMS-800W was selected to perform full test.

The worst case's test data was presented in this test report.

Model list

Model name		HMS-800W HMS-800W-C	HMS-600W HMS-600W-C
PV Input	Max. input voltage	d.c. 60V	d.c. 60V
	MPP voltage range	d.c. 25-55V	d.c. 25-55V
	Max. input current	d.c. 15/15A	d.c. 15/15A
	Isc PV(absolute maximum)	d.c. 20/20A	d.c. 20/20A
Grid Output	Rated output voltage	1/N/PE AC 220/230/240V	1/N/PE AC 220/230/240V
	Rated output frequency	50/60Hz	50/60Hz
	Max. AC output current	a.c 3.6A	a.c 2.7A
	Rated AC output power	800W	600W
	Rated/Max. apparent AC power	800VA	600VA
	Power factor	>0.99	>0.99
General	Overvoltage category	III(AC), II(DC)	III(AC), II(DC)
	Ingress protection	IP67	IP67
	Protective class	I	I
	Operating temperature range	-40ºC to 65ºC	-40ºC to 65ºC
	Inverter topology	Isolated	Isolated

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 Test Location

Test Site 1:
Jiangsu TEM-Wave Testing Service Ltd.
Address:
19-9, Xishi Road, Xinwu Dist., Wuxi, Jiangsu, China

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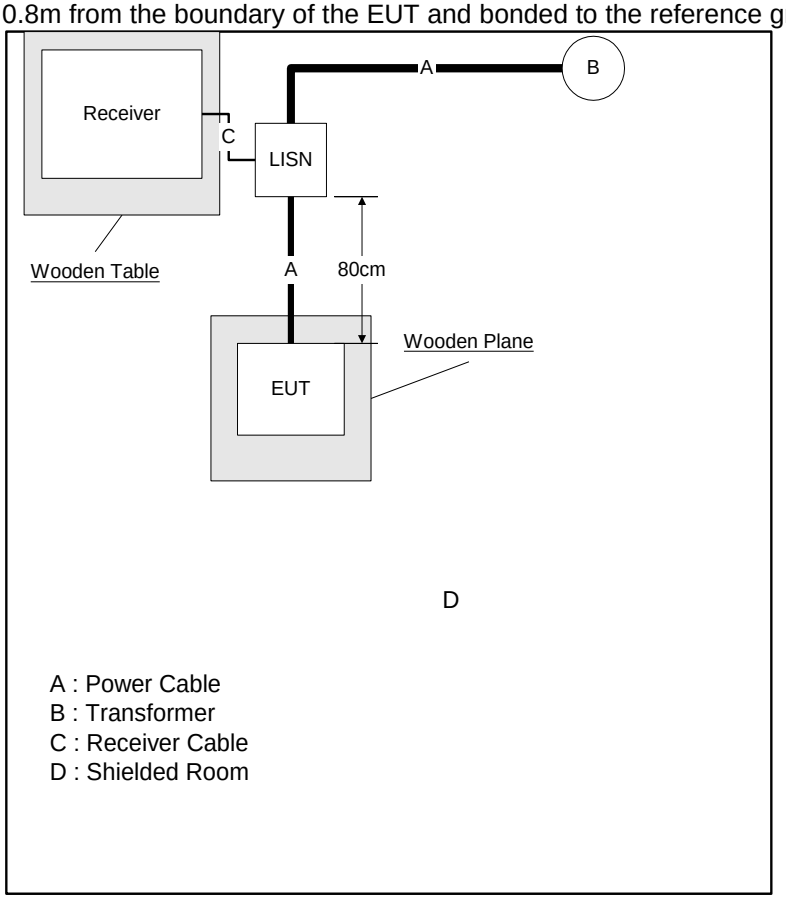
2 Test Details

2.1 Conducted Disturbance at Mains Terminals

2.1.1 Test Method

The EUT was placed on a 0.8 m non-conductive table for table-top equipment and on a 0.12 m insulated support for floor standing equipment above a ground reference plane all within a test laboratory.
All power was connected to the EUT through an Artificial Mains Network (AMN). Conducted disturbance voltage measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8m from the boundary of the EUT and bonded to the reference ground plane.



2.1.2 Specification Limits

For EN IEC 61000-6-3&EN 62920

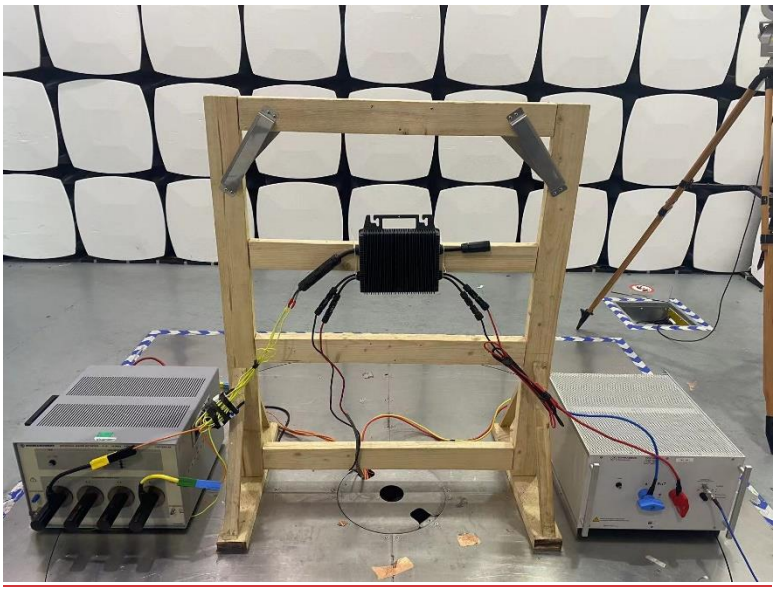
Requirement for conducted emissions				
Frequency range	AC mains port dB(μV)		DC power port dB(μV)	
MHz	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46	79	66
0.5 to 5	56	46	73	60
5 to 30	60	50	73	60

For EN 301 489-1, EN 301 489-17

table A.10 – requirements for conducted emissions from the AC mains power ports of Class B equipment			
Frequency range	Limits dB(μV)[a]		Method
	Quasi-peak	Average	AMN
150kHz to 500kHz	66 to 56	56 to 46	
500kHz to 5MHz	56	46	
5MHz to 30MHz	60	50	

Remark for test data:
*Level=Reading Level + Correction Factor
**Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

2.1.3 Test Setup



2.1.4 Test Location

This test was carried out in shielded room.

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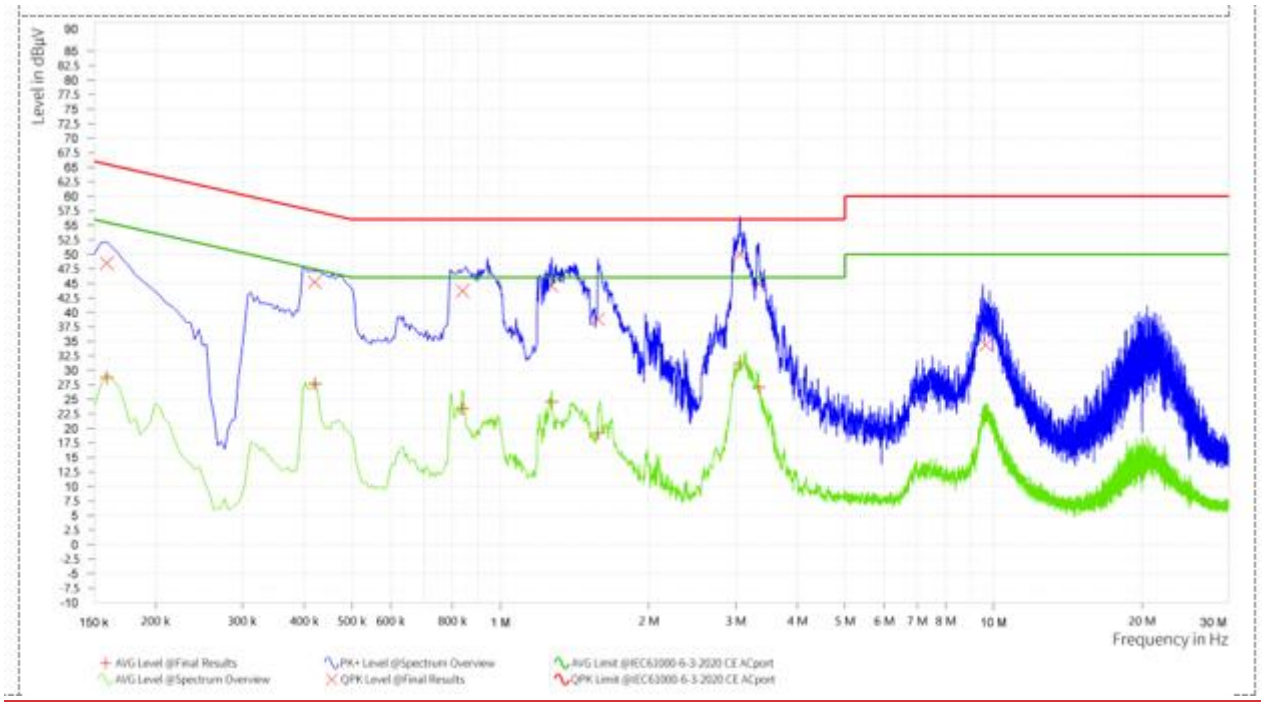
2.1.5 Test Results

Model	:	HMS-800W
Test Mode	:	TM1
Remark	:	L1
Test Date	:	2023-03-21



Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG Limit [dBµV]	AVG Margin [dB]
1	0.159	48.46	65.52	17.05	28.71	55.52	26.81
1	0.420	45.26	57.45	12.19	27.67	47.45	19.78
1	0.839	43.70	56.00	12.30	23.42	46.00	22.58
1	1.271	44.62	56.00	11.38	24.58	46.00	21.42
1	1.577	38.83	56.00	17.17	19.20	46.00	26.80
1	3.062	50.03	56.00	5.97	31.12	46.00	14.88
1	3.341	44.93	56.00	11.07	27.12	46.00	18.88
1	9.641	34.40	60.00	25.60	22.29	50.00	27.71

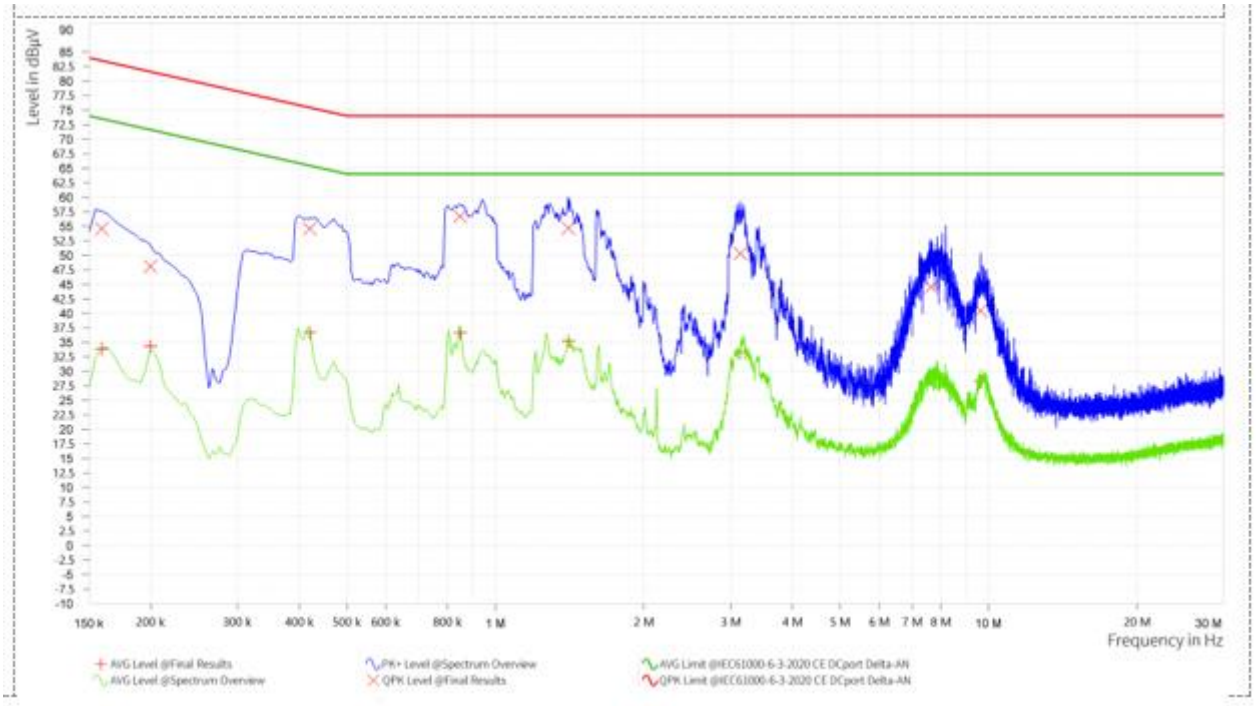
China

Model : HMS-800W
Test Mode : TM1
Remark : N
Test Date : 2023-03-21

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG Limit [dBµV]	AVG Margin [dB]
1	0.155	48.21	65.75	17.55	26.54	55.75	29.22
1	0.398	44.41	57.91	13.49	21.44	47.91	26.47
1	0.834	42.60	56.00	13.40	21.83	46.00	24.17
1	1.406	42.61	56.00	13.39	22.39	46.00	23.61
1	1.590	31.54	56.00	24.46	16.42	46.00	29.58
1	3.057	46.97	56.00	9.03	29.33	46.00	16.67
1	9.906	33.49	60.00	26.51	19.80	50.00	30.20

China

Model : HMS-800W
Test Mode : TM1
Remark : DC-
Test Date : 2023-03-21



Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG Limit [dBµV]	AVG Margin [dB]
1	0.159	54.60	83.52	28.92	33.90	73.52	39.62
1	0.200	48.07	81.63	33.56	34.34	71.63	37.29
1	0.420	54.60	75.45	20.85	36.69	65.45	28.76
1	0.848	56.73	74.00	17.27	36.67	64.00	27.33
1	1.406	54.66	74.00	19.34	35.30	64.00	28.70
1	3.138	50.34	74.00	23.66	33.33	64.00	30.67
1	7.647	44.53	74.00	29.47	28.86	64.00	35.14
1	9.636	40.46	74.00	33.54	28.24	64.00	35.76

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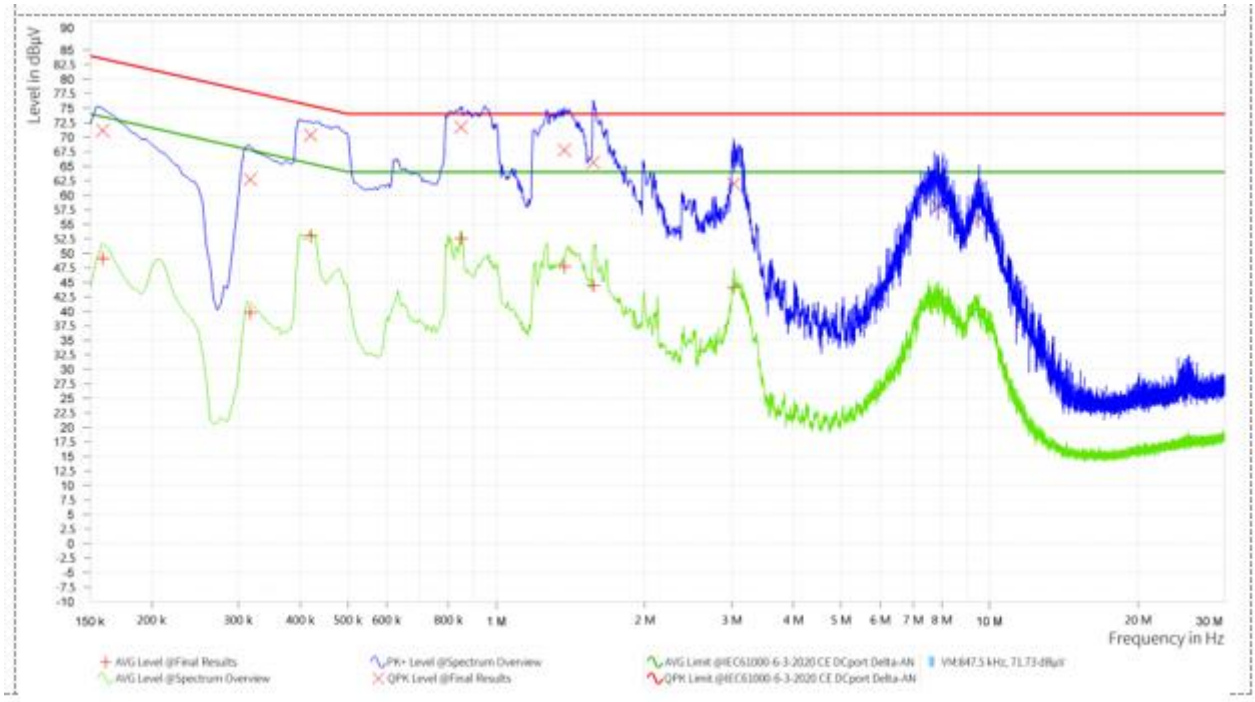
Model : HMS-800W
Test Mode : TM1
Remark : DC+
Test Date : 2023-03-21



Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG Limit [dBµV]	AVG Margin [dB]
1	0.159	71.18	83.52	12.34	49.14	73.52	24.37
1	0.317	62.77	77.80	15.03	39.77	67.80	28.03
1	0.420	70.34	75.45	5.11	53.04	65.45	12.41
1	0.848	71.73	74.00	2.27	52.51	64.00	11.49
1	1.374	67.78	74.00	6.22	47.71	64.00	16.29
1	1.572	65.65	74.00	8.35	44.42	64.00	19.58
1	3.030	61.98	74.00	12.02	44.12	64.00	19.88
1	7.863	58.06	74.00	15.94	42.39	64.00	21.61
1	9.524	56.11	74.00	17.89	40.25	64.00	23.75

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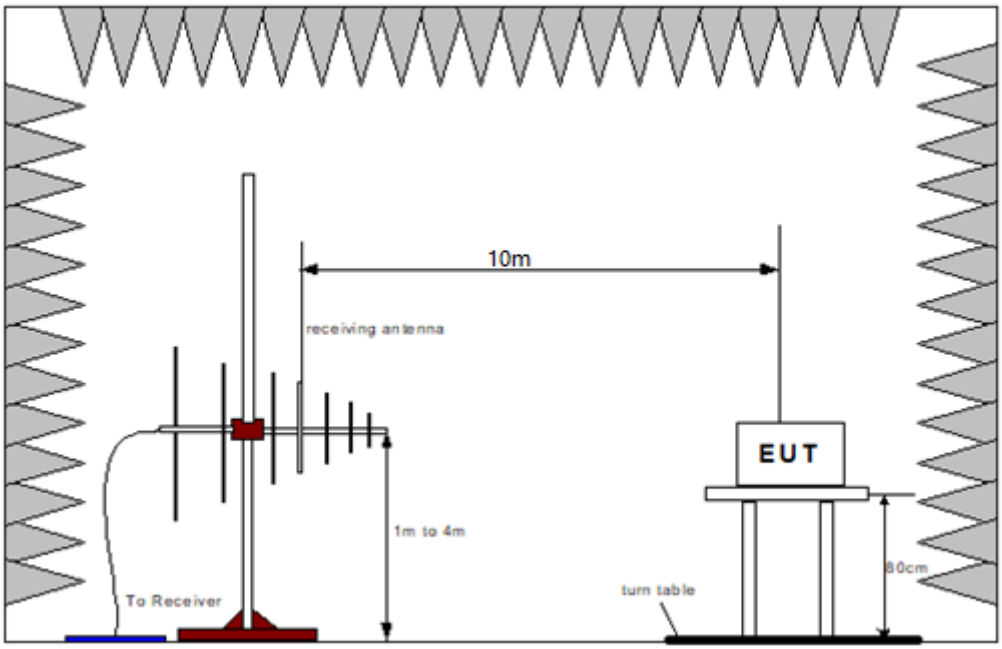
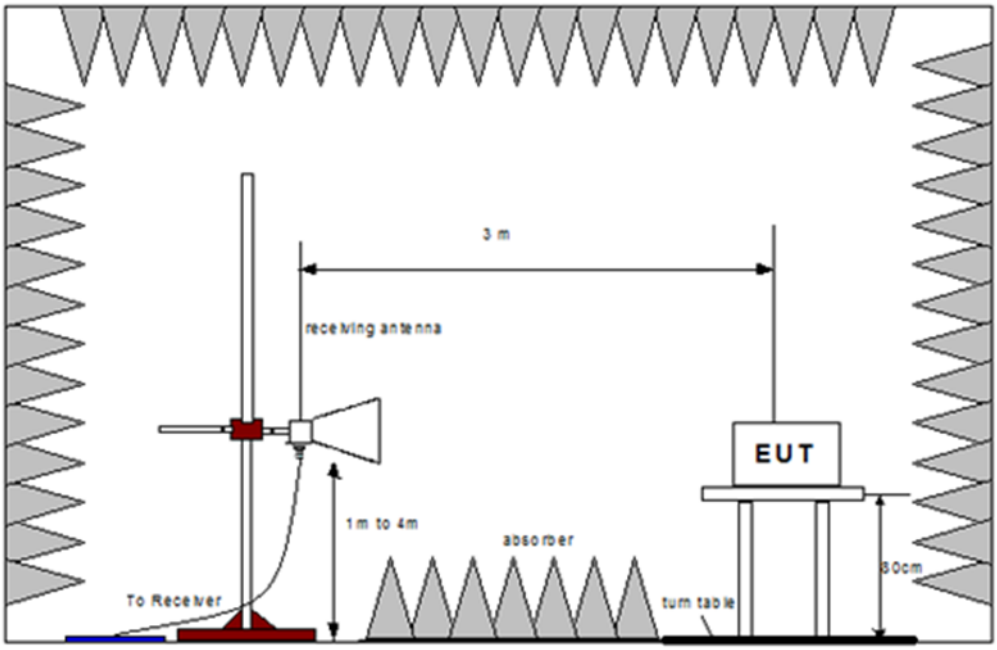
2.2 Radiated Disturbance (30MHz to 6000MHz)

2.2.1 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive
< floor 0.1 m above a reference ground plane>
< support 0.1 m above a reference ground plane>
A prescan of the EUT emissions profile was made while varying the antennae-to-EUT azimuth and antenna-to-EUT polarization using a peak detector; measurements were taken at a 10m distance. Using the prescan list of the highest emissions detected, their bearing and associated antenna polarization, the EUT was then formally measured using Quasi-Peak and Average detectors, as appropriate. The readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification.





2.2.2 Specification Limits

Radiated disturbance limits in the frequency range 30MHz to 1000MHz at a measuring distance of 3 m	
Frequency range MHz	Quasi-peak limits dB(μV/m)
30 to 230	40
230 to 1000	47

For EN 301 489-1, EN 301 489-17

Radiated disturbance limits in the frequency range 1000MHz to 6000MHz at a measuring distance of 3 m		
Frequency range MHz	Quasi-peak limits dB(μV/m)	Average
1000 to 3000	70	50
3000 to 6000	74	54

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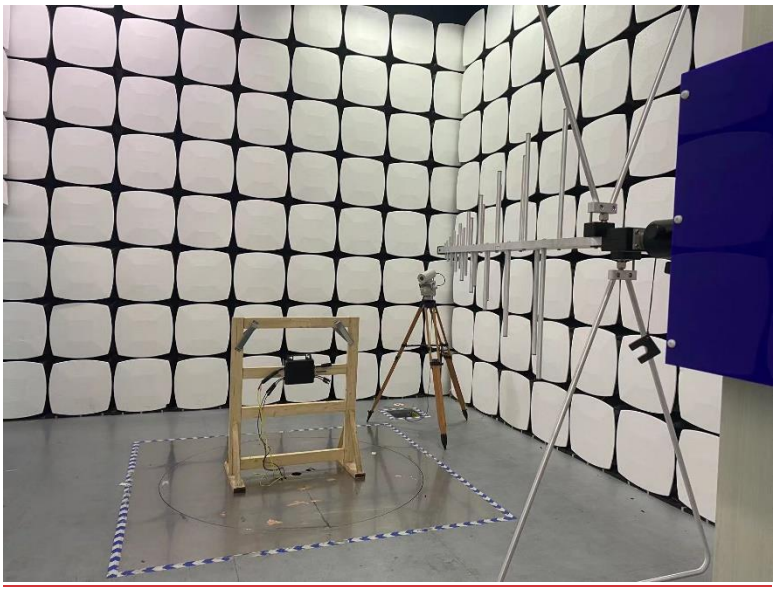
2.2.3 Test Setup

Test Setup (30MHz-1GHz)



Test Setup (1-6GHz)

2.2.4 Test Location

This test was carried out in 3m anechoic chamber.

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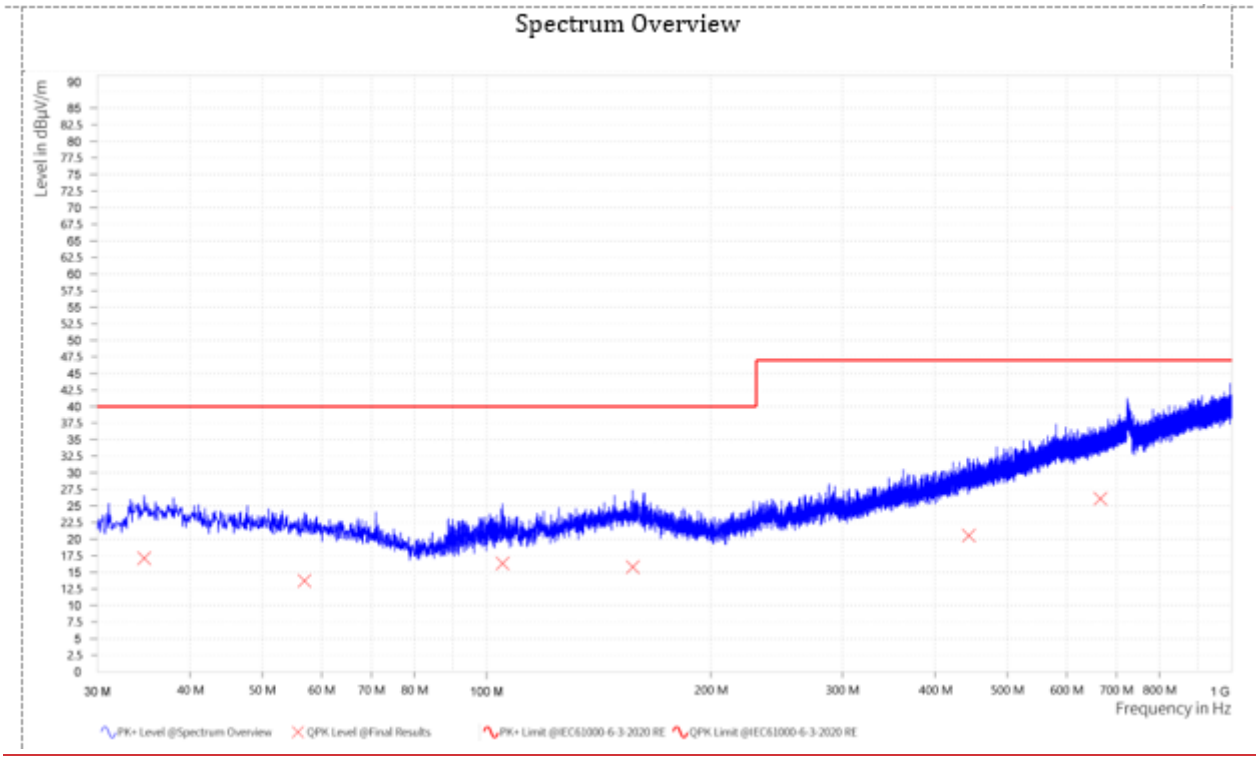
2.2.5 Test Results

Model	:	HMS-800W
Operating Mode	:	TM1
Antenna polarization	:	Horizontal ☒ Vertical☐
Test Date	:	2023-03-20

Radiated Electromagnetic Emissions 30MHz-1000MHz



No significant emission was detected within 6 dB to limit.

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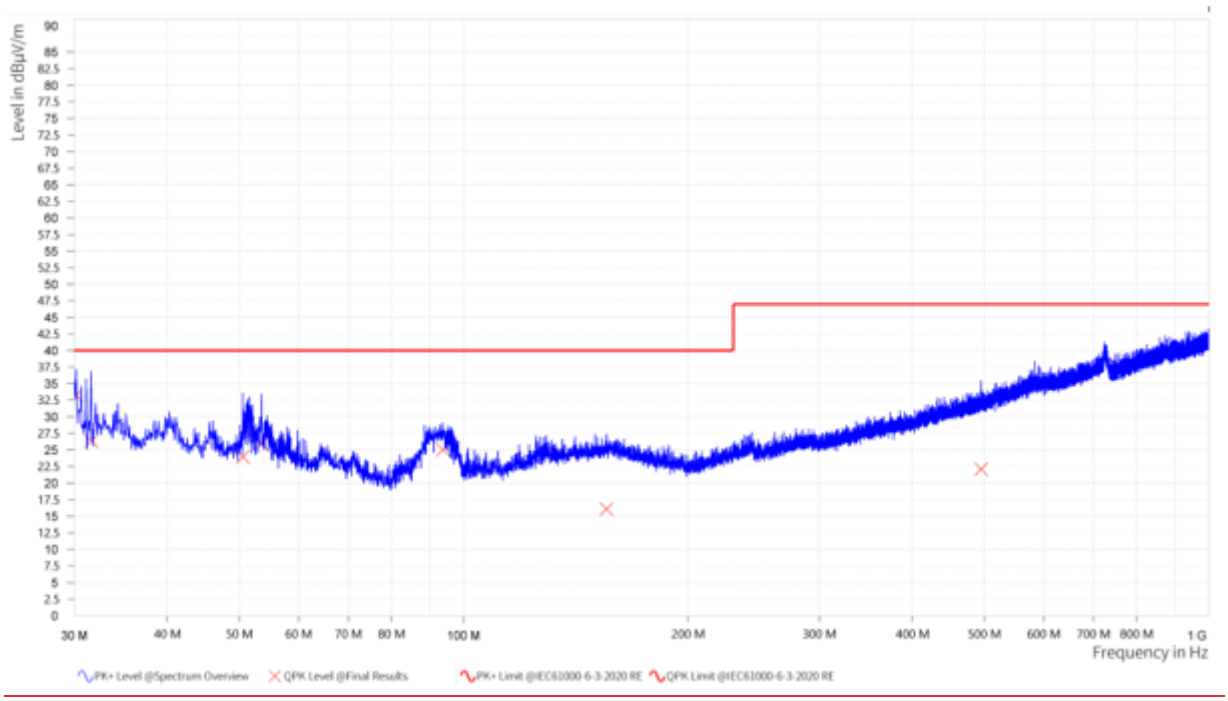
Model : HMS-800W
Operating Mode : TM1
Antenna polarization : Horizontal ☐ Vertical☒
Test Date : 2023-03-20

Radiated Electromagnetic Emissions 30MHz-1000MHz

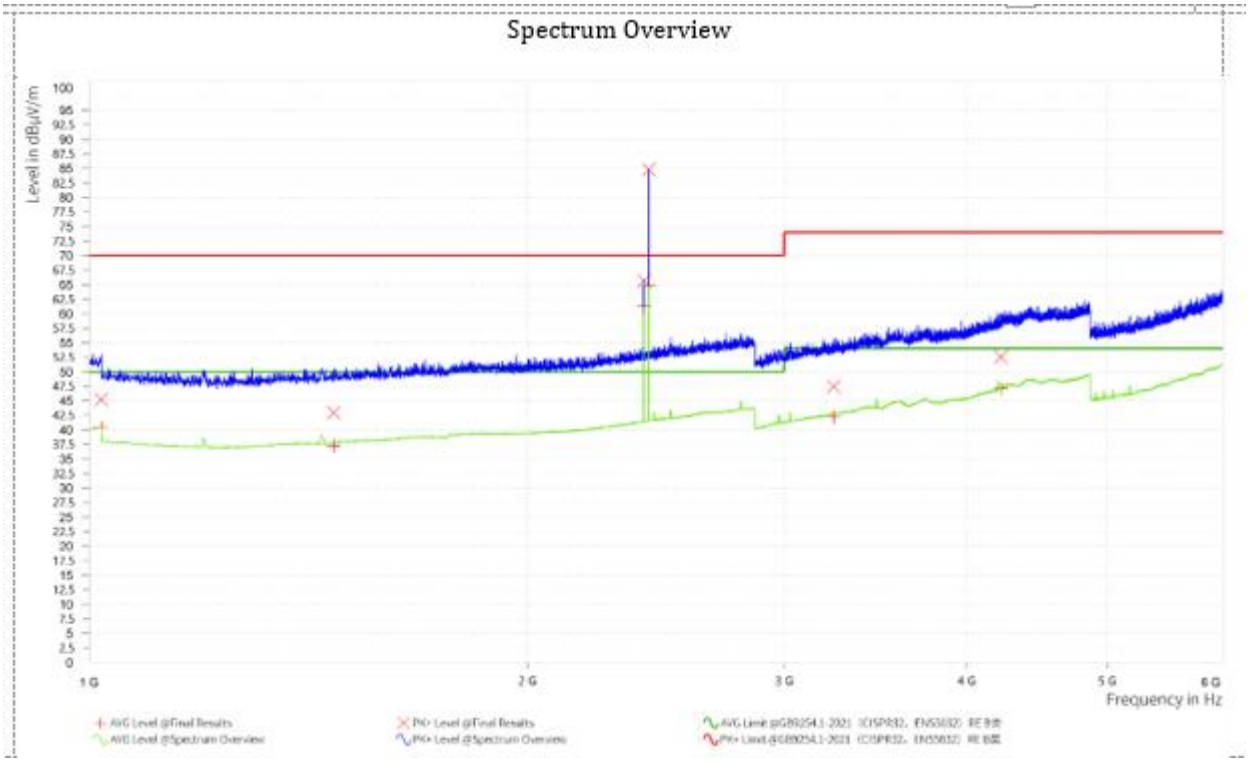


Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]
30.180	33.28	40.00	6.72
31.620	26.34	40.00	13.66
50.520	23.93	40.00	16.07
53.520	25.94	40.00	14.06
93.720	25.04	40.00	14.96
155.520	16.09	40.00	23.91
495.000	22.08	47.00	24.92

China

Model	:	HMS-800W
Operating Mode	:	TM1
Antenna polarization	:	Horizontal ☒ Vertical☐
Test Date	:	2023-03-20

Radiated Electromagnetic Emissions 1000MHz-6000MHz



No significant emission was detected within 6 dB to limit

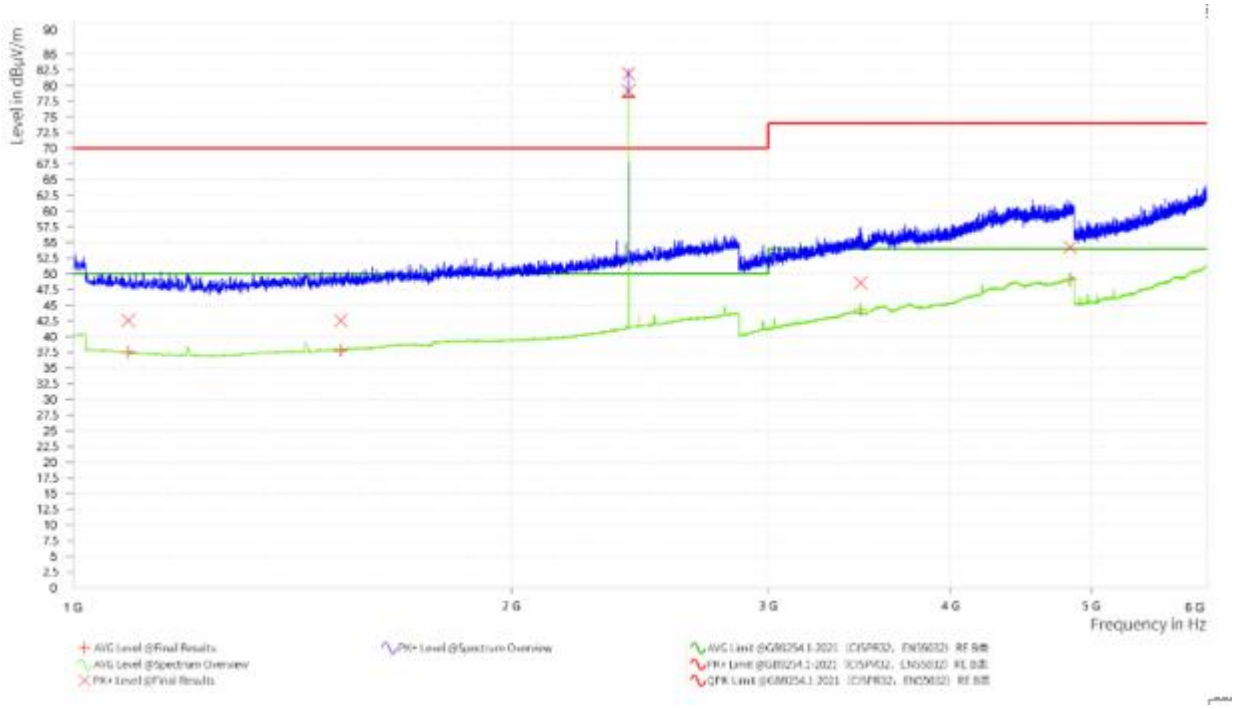
Remark: 2.4GHz is the operating frequency for wifi/bt module. It's excluded at this report.

Frequency (MHz)	Pol
2,403.500	H
2,422.500	H

China

Model	:	HMS-800W
Operating Mode	:	TM1
Antenna polarization	:	Horizontal ☐ Vertical☒
Test Date	:	2023-03-20

Radiated Electromagnetic Emissions 1000MHz-6000MHz



No significant emission was detected within 6 dB to limit

Remark: 2.4GHz is the operating frequency for wifi/bt module. It's excluded at this report.

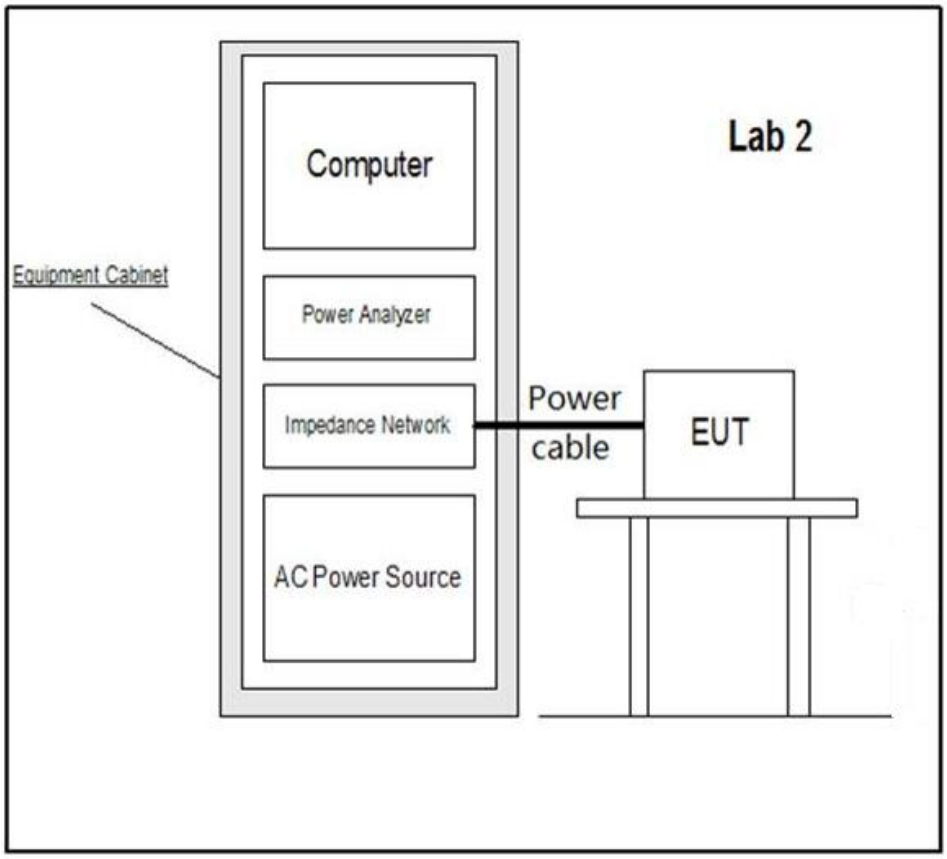
Frequency (MHz)	Pol
2,405.500	V
2,406.000	V

China

2.3 Harmonic current emission

2.3.1 Test Method

Harmonic current test should be conducted with the user's operation control or automatic programs set to the mode expected to produce the maximum total harmonic current under normal operating conditions.
Specific test conditions for the measurement of harmonic currents associated with some types of equipment are given in test equipment list.



2.3.2 Specification Limits

Limits for class A Equipment	
Harmonic order n	Maximum permissible harmonic 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(15/n)
Even harmonics	

Limits for class A Equipment	
2	1.08
4	0.43
6	0.30
8≤ n ≤40	0.23(8/n)

2.3.3 Test Setup

N/A

2.3.4 Test Location

N/A

2.3.5 Test Results

Results for Configuration and Mode: N/A

Performance assessment of the EUT made during this test: N/A

Detailed results are shown below.

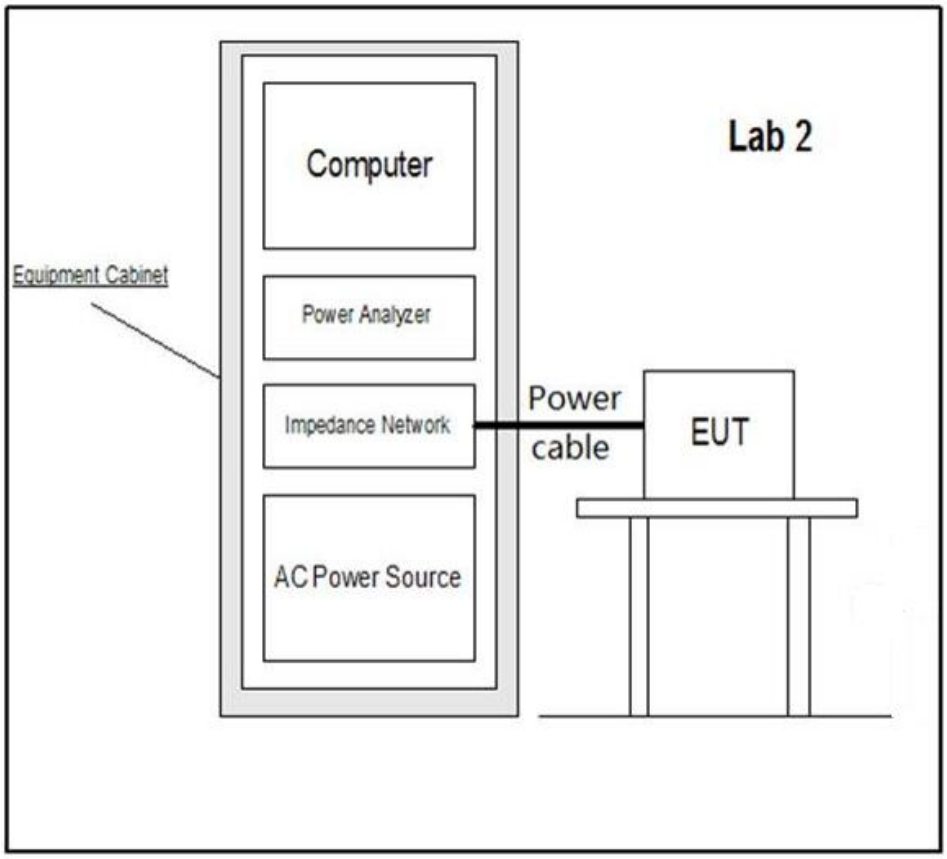
Test date: N/A N/A

China

2.4 Flicker

2.4.1 Test Method

Flicker test should be conducted with the user's operation controls or automatic programs set to the mode expected to produce the most unfavourable sequence of voltage change, using only those combinations of controls and programmes which are mentioned by the manufacturer in the instruction manual, or are otherwise likely to be used.



2.4.2 Specification Limits

The value of *P*st shall not be greater than 1.0
The value of *P*lt shall not be greater than 0.65
*T*max, the accumulated time value of *d*(t) with a deviation exceeding 3.3% during a single voltage change at the EUT terminals, shall not exceed 500ms
The maximum relative steady-state voltage change, *d*c, shall not exceed 3.3%
The maximum relative voltage change *d*max, shall not exceed

a) 4% without additional conditions

b) 6% for equipment which is:

- Switched manually, or
- Switched automatically more frequently than twice per day, and also has either a delayed start, or manual restart, after a power supply interruption

c) 7% for equipment which is:

- Attended whilst in use, or
- Switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart or manual restart, after a power supply interruption

2.4.3 Test Setup

N/A

2.4.4 Test Location

N/A

2.4.5 Test Results

Results for Configuration and Mode: N/A

Performance assessment of the EUT made during this test: N/A

Detailed results are shown below.

Test date: N/A

China

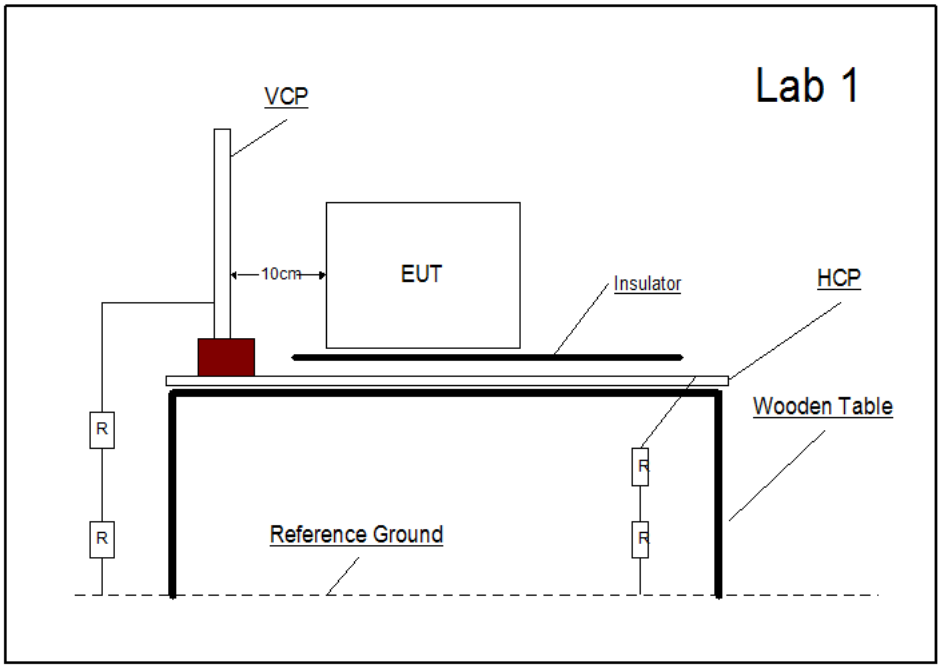
2.5 Electrostatic discharge immunity test

2.5.1 Test Method

The equipment under test including associated cabling was configured on but insulted from, using a 0.5mm isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive floor for Floor-Stand equipment; and on a 0.1 m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

Using the air discharge method for non-metallic parts, contact discharge method for metallic parts with both vertical and horizontal couple plane discharge methods for the sides of the equipment under test, the required electrostatic discharge voltage levels in both voltage polarities were applied at the detailed pulse repartition rate.

During this testing any anomalies in the equipment under tests performance was recorded.



Floor-Stand equipment

VCP: Vertical Coupling Plane 0.5 x 0.5 m HCP: Horizontal Coupling Plane 0.95 x 1.6 m

R. Ground: 2 x 2 m R: 470 KΩ

2.5.2 Specification Limits

Required Test Levels				
Discharge type	Discharge Level (kV)		Number of discharges per location (each polarity)	Performance Criteria
	Positive	Negative		
Air – Direct	8	8	10	B
Contact – Direct	4	4	10	B
Contact – Indirect	4	4	10	B

2.5.3 Test Setup

X: Contact Discharge, O: Air Dischage

Test point

China

2.5.4 Test Location

This test was carried out in EMS Test Location.

2.5.5 Test Results

Test models: HMS-800W

Results for Configuration and Mode: TM1/TM2/TM3

Performance assessment of the EUT made during this test: Pass (A)

Detailed results are shown below.

Test date: 2023-03-21

Test Point	Discharge	Results: Met Performance Criteria									
		2kV		4kV		6kV		8kV		15kV	
		+	-	+	-	+	-	+	-	+	-
HCP	Contact	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VCP	Contact	N/A	N/A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
Each conductive location touchable by hand	Contact	N/A	N/A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
Each nonconductive location touchable by hand	Air	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A
N/A	Not Appliance										

Remark: No observable change.

China

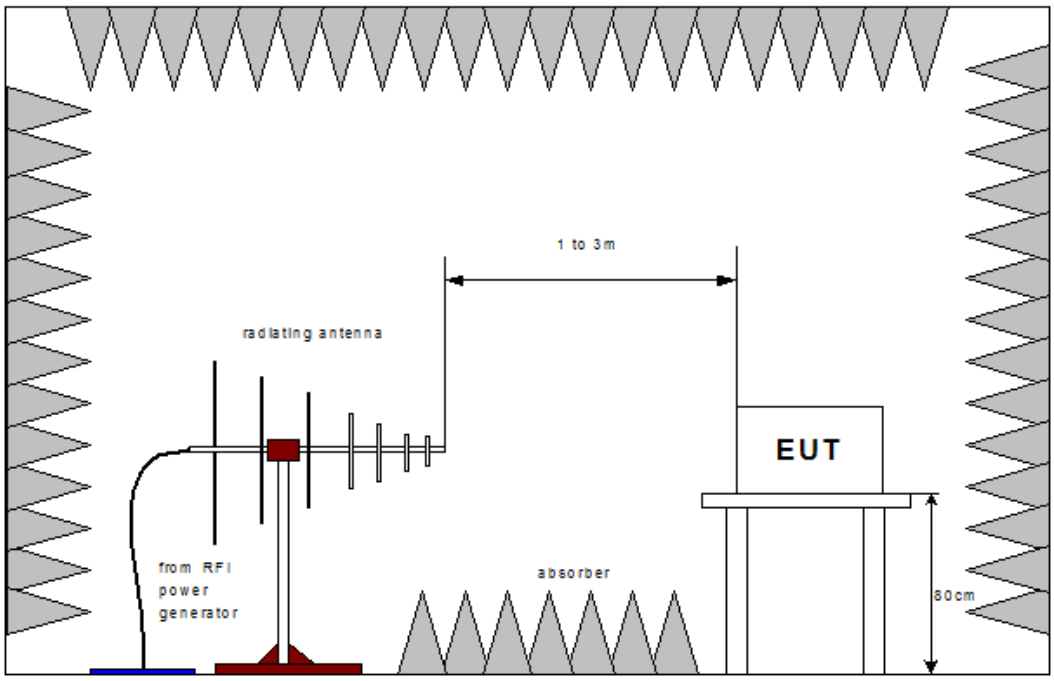
2.6 Enclosure Port - Radio-frequency electromagnetic field Amplitude modulated

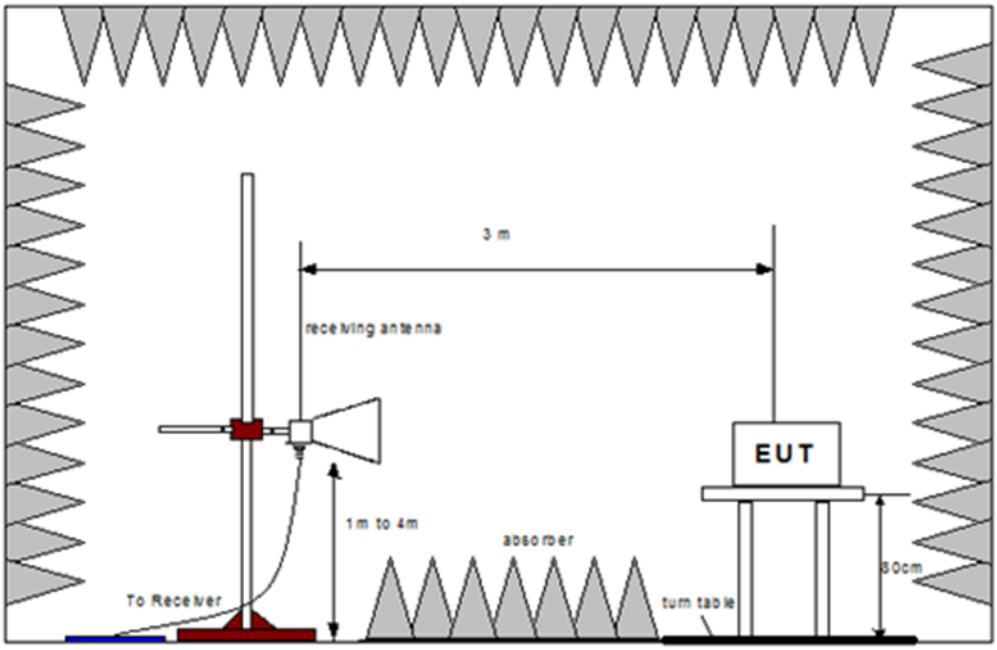
2.6.1 Test Method

The equipment under test including associated cabling was configured, on a 0.1 m non-conductive floor for Floor-Stand equipment and on a 0.1 m insulated support for floor standing equipment; with a pre-calibrated semi anechoic chamber.

All four sides of the equipment under test were subjected to the required RF field strength, modulated as described, swept over the frequency range of test with the antenna positioned in both horizontal and vertical polarizations.

During this testing any anomalies in the equipment under tests performance was recorded.





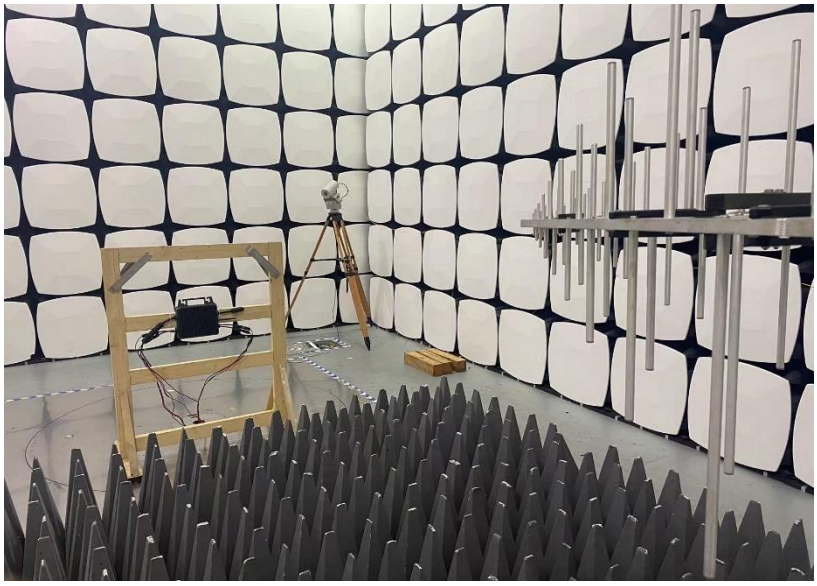
2.6.2 Specification Limits

Required Test Levels					Performance Criteria
Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
80 to 1000	3	AM (80 %,1 kHz, sine wave)	1	1	A
1000 to 6000	3	AM (80 %,1 kHz, sine wave)	1	1	A
Supplementary information: Note 1. EUT powered at one of the Nominal input voltages and frequencies					

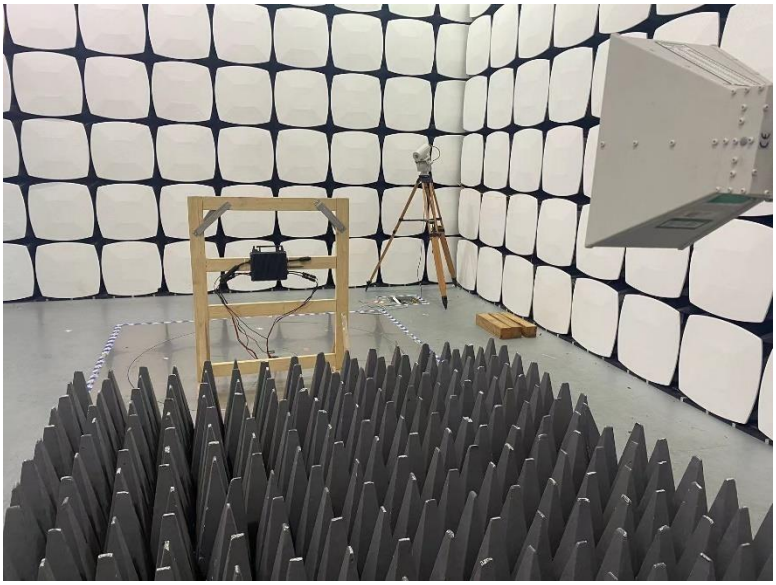
China

2.6.3 Test Setup

30MHz-1GHz



1GMHz-6GHz



2.6.4 Test Location

This test was carried out in EMS Test Location.

China

2.6.5 Test Results

Test models: HMS-800W

Results for Configuration and Mode: AC Powered, TM1/TM2/TM3

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Test date: 2023-03-21

Tabulated Results for RF Electromagnetic Field 80 - 1000 MHz					
Side of the equipment under test	Antenna polarization	Test Level	Dwell Time	Measuring distance	Results
All sides	Horizontal	3 V/m	1 s	3 m	A
All sides	Vertical	3 V/m	1 s	3 m	A

Tabulated Results for RF Electromagnetic Field 1000 - 6000 MHz					
Side of the equipment under test	Antenna polarization	Test Level	Dwell Time	Measuring distance	Results
All sides	Horizontal	3 V/m	1 s	3 m	A
All sides	Vertical	3 V/m	1 s	3 m	A

Remark: No observable change.

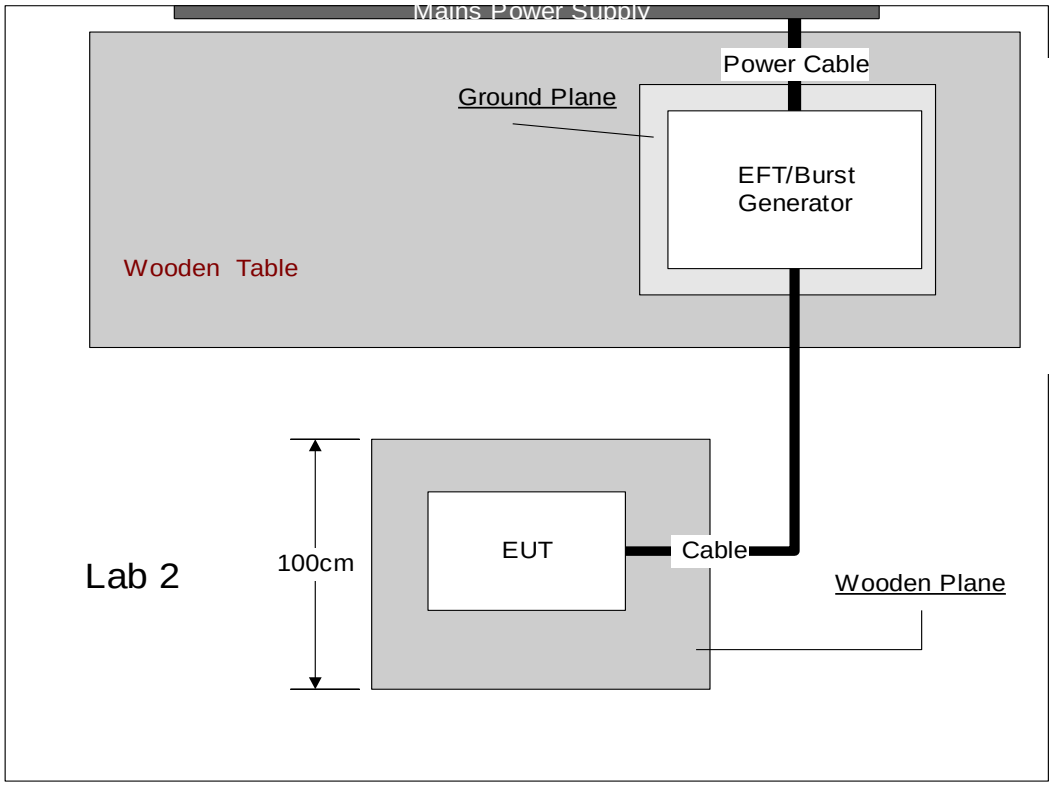
2.7 Electrical fast transient /burst immunity test

2.7.1 Test Method

The equipment under test including associated cabling was configured on but insulated from, using a 0.1 m isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive table for table-top equipment; and on a 0.1 m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

Using a CDN for power ports, capacitive coupling clamp for signal and control ports and a 33nF coupling capacitor for earth ports, the required fast transient burst voltage levels in both voltage polarities were applied at the detailed pulse repartition rate and duration of test.

During this testing any anomalies in the equipment under tests performance was recorded.



China

2.7.2 Specification Limits

For EN IEC 61000-6-1&EN 62920

Required Test Levels Input and output a.c. power ports					
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	Performance Criteria
Input and output a.c. power ports	± 1	5 kHz	2 min per polarity	Direct	B
For extra low voltage a.c. ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.					

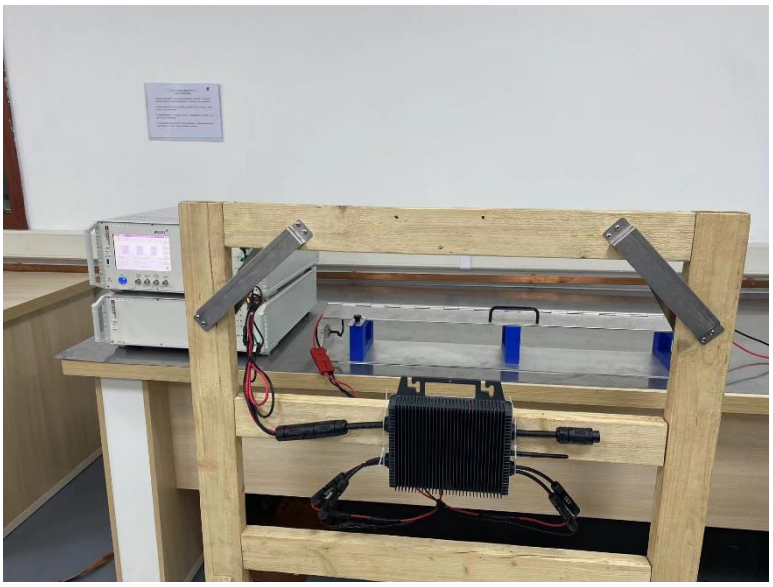
Required Test Levels ports for DC Power Port					
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	Performance Criteria
DC Power port	± 0.5	5 kHz	2 min per polarity	Clamp	B
Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the equipment for recharging. Equipment with a DC power input port intended for use with a dedicated AC–DC power adaptor shall be tested on the AC power input of the AC–DC power adaptor specified by the manufacturer (see the test level of Table 4). Where no adaptor is specified, the test shall be done on the DC power port using the test level of Table 4. Where an adaptor is specified, the test is applicable to DC power input ports only when intended to be connected permanently to cables longer than 3 m. The test may be performed at one or at both repetition frequencies. The use of 5 kHz repetition frequency is traditional; however, 100 kHz is closer to reality.					

Required Test Levels ports for signal and control lines					
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	Performance Criteria
Signal and control lines	± 0.5	5 kHz	2 min per polarity	Clamp	B
Applicable only to ports interfacing with cables whose total length can exceed 3m according to the manufacturer’s function specification.					

For EN 301 489-1 V2.2.3 & EN 301 489-17 V3.2.4

Test Results of Electrical Fast Transient Bursts		
Ports	Measuring condition Couple mode	Performance criterion
AC Power Port	Level:±1.0kV, Tr/Th: 5/50ns, 5kHz Interval: 120 seconds	B
DC Power Port	Level:±0.5kV, Tr/Th: 5/50ns, 5kHz Interval: 120 seconds	B
Signal Port	Level:±0.5kV, Tr/Th: 5/50ns, 5kHz Interval: 120 seconds	B
xDSL	Level:±0.5kV, Tr/Th: 5/50ns, 100kHz Interval: 120 seconds	B

2.7.3 Test Setup



2.7.4 Test Location

This test was carried out in EMS Test Location.

2.7.5 Test Results

Test models: HMS-800W

Results for Configuration and Mode: AC powered, TM1, TM5

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

Test date: 2023-03-21

Tabulated Results for Fast Transient Burst Immunity					
Line under test	Test Level (kV)	Repetition Rate	Test Duration	Coupling Method	Result
AC Power Line	± 1.0 kV	5 kHz	2 min	Direct	A
DC Power Line	± 0.5 kV	5 kHz	2 min	Clamp	A
Signal Line	± 0.5 kV	5 kHz	2 min	Clamp	N/A

Remark: No observable change.

China

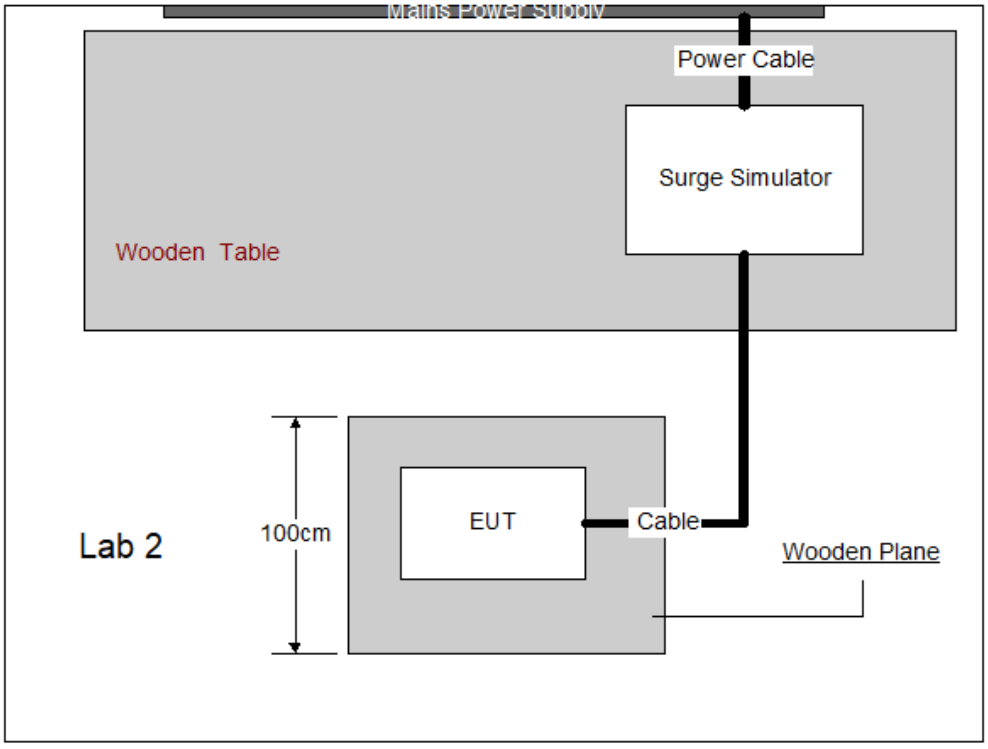
2.8 Surge immunity test

2.8.1 Test Method

The equipment under test including associated cabling was configured, on a 0.8 m non-conductive table for table-top equipment and on a 0.1 m insulated support for floor standing equipment above a ground reference plane all within a test laboratory.

Using CDNs for power ports and appropriate coupling methods for applicable signal and control ports, the required number of surges was applied for each surge voltage level using both positive and negative surge voltage polarities. Surges were applied at the power line frequency phase angles and repartition rates detailed.

During this testing any anomalies in the equipment under tests performance was recorded.



2.8.2 Specification Limits

For EN IE 61000-6-2&62920

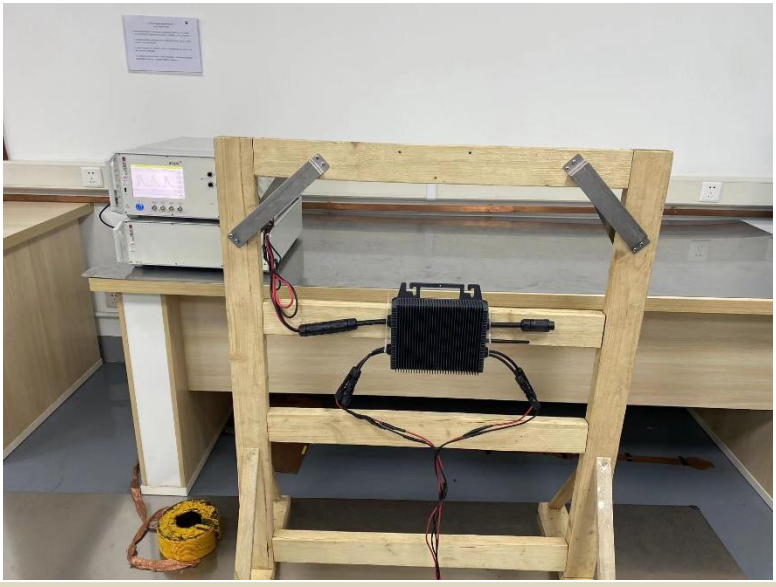
Required Test Levels Input and output a.c. power ports			Performance Criteria
Line Under Test	Characteristics	Test Levels	
line to line with line to earth with	Wave-shape data 2Ω impedance 12Ω impedance	1.2/50 μs ± 1.0 kV ±2.0 kV	B
Note in addition to the specified test level, all lower levels as detailed in IEC 61000-4-5 should also be satisfied**.**			

Required Test Levels Ports for signal lines and control lines			Performance Criteria
Line Under Test	Characteristics	Test Levels	
line to earth with	Wave-shape data 42Ω impedance	1.2/50 μs ± 1.0 kV	B
Applicable only to ports interfacing with long distance lines(>30m). Where the normal functioning cannot be achieved because of the impact of the coupling/decoupling network (CDN) on the EUT, the test shall be done with the reduced functionality. A rationale shall be given in the test report for doing so. After the test and the removal of the CDN, the normal function shall not be affected.			

For EN 301 489-1 V2.2.3 & EN 301 489-17 V3.2.4

Characteristics	Test Levels	Performance Criteria
Wave- shape data Test levels line to line line to ground	1.2/50 μs ± 1.0 kV ±2.0 kV	B

2.8.3 Test Setup



2.8.4 Test Location

This test was carried out in EMS Test Location.

2.8.5 Test Results

Test models: HMS-800W

Results for Configuration and Mode: AC Powered, TM1/TM2/TM3

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

Test date: 2023-03-21

Tabulated Results for Surge Immunity (AC Power Ports)						
Line Name	Coupling	Level	Phase Angle	No of Pulses	Repetition Rate	Result
AC Power Cord	Live to Neutral	±1.0kV	0, 90, 180,270 deg	5	60 sec	A
AC Power Cord	Live to Earth	±2.0kV	0, 90, 180,270 deg	5	60 sec	A
AC Power Cord	Neutral to Earth	±2.0kV	0, 90, 180,270 deg	5	60 sec	A

Tabulated Results for Surge Immunity (Signal and Control Ports)						
Line Name	Coupling	Level	Phase Angle	No of Pulses	Repetition Rate	Result
Signal Cord	Line to Earth	±1.0kV	0, 90, 180,270 deg	5	60 sec	N/A

Remark: No observable change.

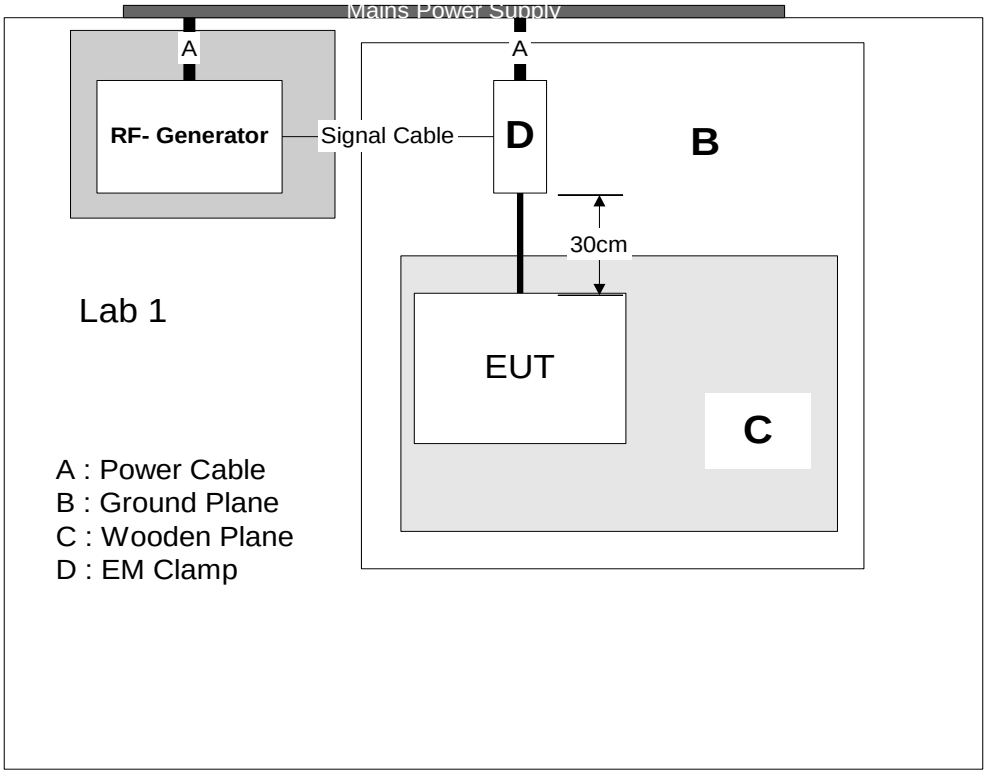
2.9 Immunity to conducted disturbances, induced by radio-frequency fields

2.9.1 Test Method

The equipment under test was configured, on but insulated from, using a 0.1 m isolator, a horizontal coupling plane fitted to the top of a 0.1 m non-conductive table for table-top equipment, above a ground reference plane all within a test laboratory.

All associated cabling was configured, on but insulated from, using a 50 mm isolator, the same horizontal coupling plane as the equipment under test.

Using CDNs, EM Clamps or current clamps as appropriate, the power ports and applicable signal and control ports were subjected to the required, pre calibrated RF injected signal strength, modulated as described, swept over the frequency range of test.
During this testing any anomalies in the equipment under tests performance was recorded.



2.9.2 Specification Limits

For EN IEC 61000-6-1&62920

Required Test Levels Input and output a.c. power ports						
Line Under Test	Frequency Range (MHz)	Level (V)	Modulation	Step Size (%)	Dwell (s)	Performance Criteria
Input and output a.c. power ports	0.15 to 80	3	AM (80 %,1 kHz, sine wave)	1	3	A
For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.						

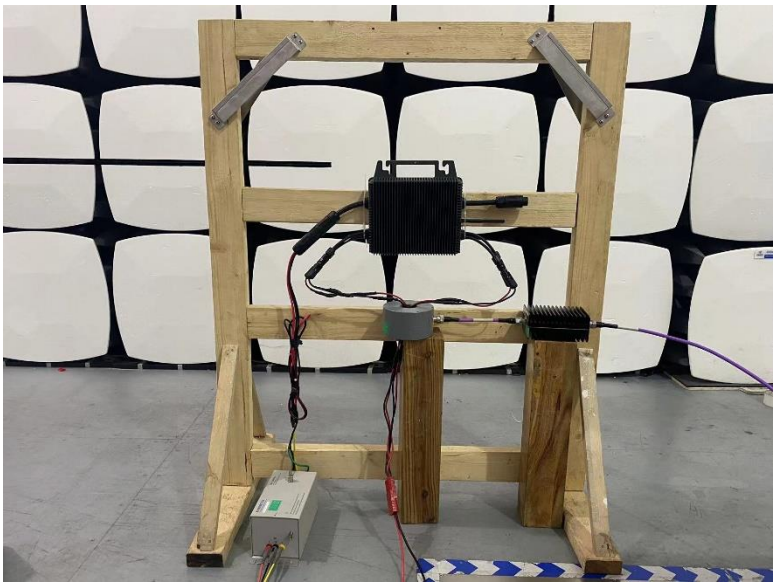
Required Test Levels Input and output D.C. power ports						
Line Under Test	Frequency Range (MHz)	Level (V)	Modulation	Step Size (%)	Dwell (s)	Performance Criteria
Input and output d.c. power ports	0.15 to 80	3	AM (80 %,1 kHz, sine wave)	1	3	A
For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.						

Required Test Levels Ports for signal lines and control lines						
Line Under Test	Frequency Range (MHz)	Level (V)	Modulation	Step Size (%)	Dwell (s)	Performance Criteria
Signal and control port	0.15 to 80	3	AM (80 %,1 kHz, sine wave)	1	3	A
Applicable only to ports interfacing with cables whose total length may exceed 3m according to the manufacturer’s function specification.						

For EN 301 489-1 V2.2.3 & EN 301 489-17 V3.2.4

Required Test Levels at ports for signal and control lines						
Line Under Test	Frequency Range (MHz)	Level (V)	Modulation	Step Size (%)	Dwell (s)	Performance Criteria
Signal and control lines	0.15 to 80	3	AM (80 %,1 kHz, sine wave)	1	1	A

2.9.3 Test Setup



2.9.4 Test Location

This test was carried out in EMS Test Location.

2.9.5 Test Results

Test models: HMS-800W

Results for Configuration and Mode: AC Powered, TM1/TM2/TM3

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

Test date: 2023-03-21

Tabulated Results for Injected current						
Line and sensitive frequency under test	Test Level	Step	Dwell Time	Coupling Method	Modulation	Result
AC Power line	3V	1%	3s	CDN	1kHz, 80%	A
DC Power line	3V	1%	3s	Clamp	1kHz, 80%	A
Signal line	3V	1%	3s	Clamp	1kHz, 80%	N/A

Remark: No observable change.

China

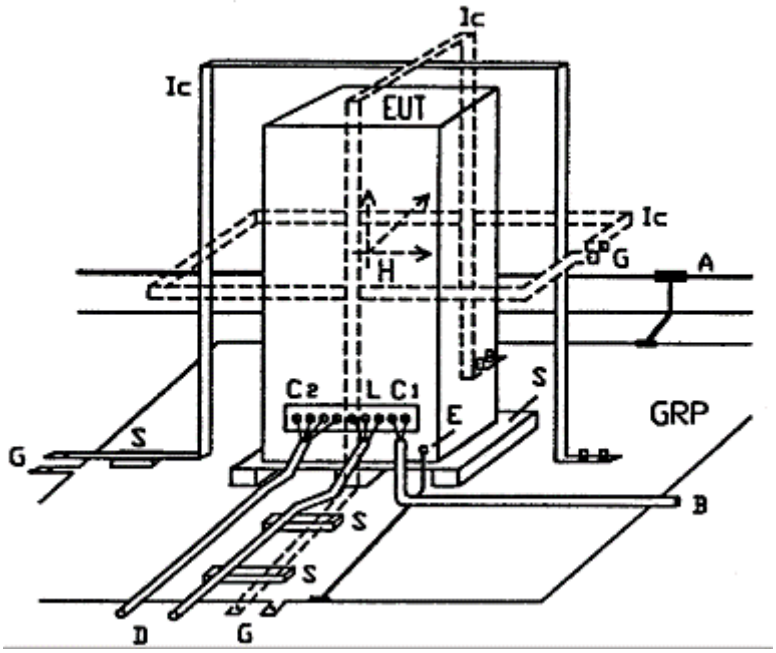
2.10 Enclosure Port - Power-frequency magnetic field

2.10.1 Test Method

The equipment under test including associated cabling was configured on a non-conductive support at the volumetric center of the immunity coils. A pre calibrated input level was then applied to magnetic immunity coils at the detailed frequency and level for the required test period.

The EUT was retested with the magnetic field applied in all 3 orthogonal planes of the EUT.

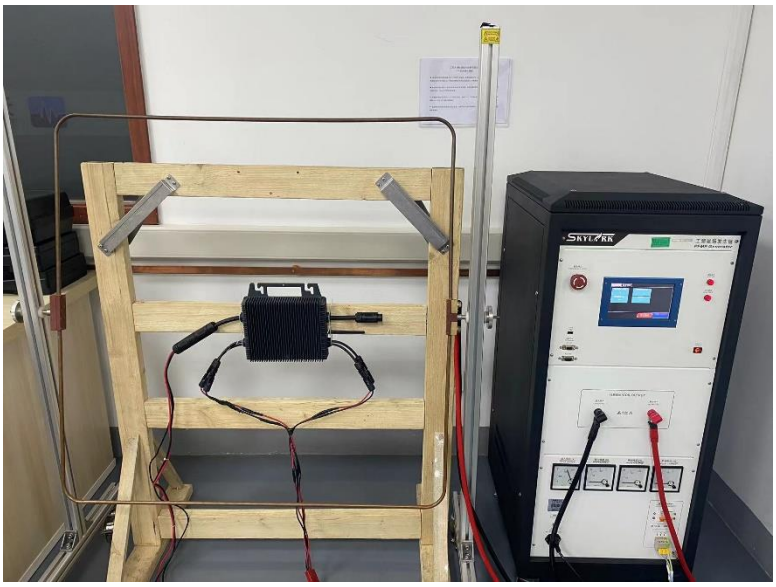
During this testing any anomalies in the equipment under tests performance was recorded.



2.10.2 Specification Limits

Required Test Levels			Performance Criteria
Application	Level (A/m)	Duration	
Continuous Field	30	dependent on EUT operating cycle	A
Supplementary information: Note 1. EUT powered at one of the Nominal input voltages and frequencies			

2.10.3 Test Setup



2.10.4 Test Location

This test was carried out in EMS Test Location.

2.10.5 Test Results

Test models: HMS-800W

Results for Configuration and Mode: AC Powered, TM1/TM2/TM3

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

Test date: 2023-03-21

Tabulated Results for Power Frequency Magnetic Immunity					
Orientation	Operating Frequency	Test Frequency	Test Level	Duration	Result
X axis	50Hz	50Hz	30 A/m	1 min	A
Y axis	50Hz	50Hz	30 A/m	1 min	A
Z axis	50Hz	50Hz	30 A/m	1 min	A

Remark: No observable change.

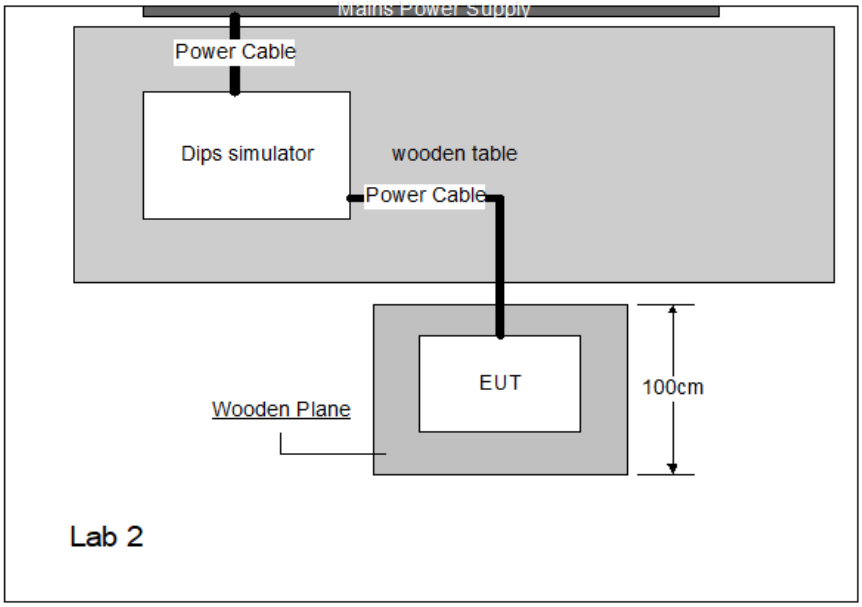
China

2.11 Voltage dips, short interruptions and voltage variations immunity tests

2.11.1 Test Method

The equipment under test including associated cabling was configured, on a 0.8 m non-conductive table for table-top equipment and on a 0.1 m insulated support for floor standing equipment above a ground reference plane all within a test laboratory.

Using a programmable power supply the equipment under test was subjected to the detailed supply voltage dips and interruptions. The required supply phase synchronization and test repetition rate, detailed, was controlled by the programmable power supply.
During this testing any anomalies in the equipment under tests performance was recorded.



2.11.2 Specification Limits

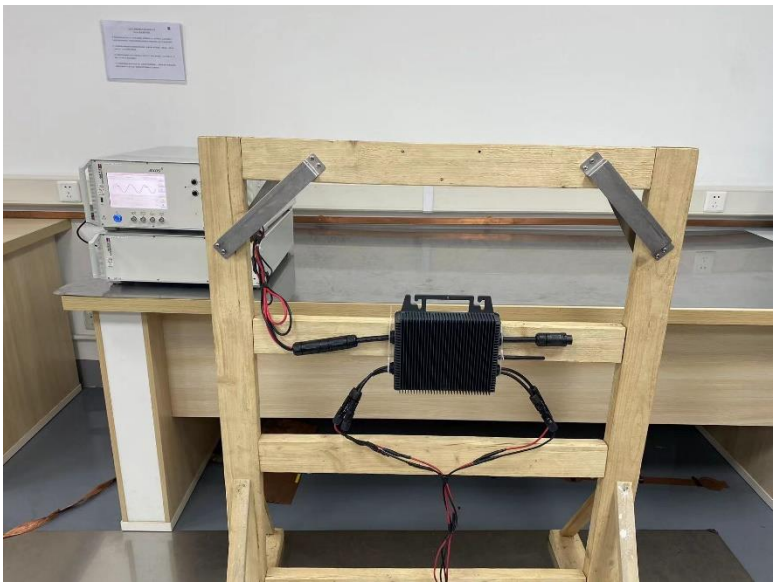
For EN IEC 61000-6-2&62920

Voltage Dips				
Voltage Dips in % UT	Test level in % UT	Duration		Performance Criteria
		50Hz	60Hz	
100	0	0.5 cycle	0.5 cycle	B
100	0	1 cycle	1 cycle	B
30	70	25 cycles	30 cycles	C
100	0	250 cycles	300 cycles	C
UT is the rated voltage of the Equipment Under Test				

For EN 301 489-1 V2.2.3 & EN 301 489-17 V3.2.4

Test Results of Voltage Dips and Short Interruption		
Ports	Measuring condition	Performance criterion
	Voltage dip: 0 % residual voltage for 0,5 cycle	A
	Voltage dip: 0 % residual voltage for 1 cycle	B
	Voltage dip: 70 % residual voltage for 25 cycles (at 50 Hz), 30 cycles (at 60 Hz)	B
	Voltage interruption: 0 % residual voltage for 250 cycles (at 50 Hz), 300 cycles (at 60 Hz)	B, C
Remark: Performance criterion B: EUT stop work during test but can recover by itself after test. For EN 301 489-1, C is acceptable for wireless connection.		

2.11.3 Test Setup



2.11.4 Test Location

This test was carried out in EMS Test Location.

China

2.11.5 Test Results

Test models: HMS-800W

Results for Configuration and Mode: AC Powered, TM1/TM2/TM3

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

Test date: 2023-03-21

For EN IEC 61000-6-1&62920

Tabulated Results for Voltage Dip and Short Interruption					
Line under test	Vnom	Operating Frequency	Test Level	Duration	Result
Power line	230 V~	50 Hz	0% of Vnom	½ cycle	A
Power line	230 V~	50 Hz	0% of Vnom	1 cycle	B
Power line	230 V~	50Hz	70% of Vnom	25 cycles	B
Power line	230 V~	50 Hz	0% of Vnom	250 cycles	B

For EN 301 489-1 V2.2.3 & EN 301 489-17 V3.2.4

Tabulated Results for Voltage Dip and Short Interruption					
Line under test	Vnom	Operating Frequency	Test Level	Duration	Results
Power line	230 V~	50Hz	0% of Vnom	½ cycle	A
Power line	230 V~	50Hz	0% of Vnom	1 cycle	B
Power line	230 V~	50Hz	70% of Vnom	25 cycles	B
Power line	230 V~	50Hz	0% of Vnom	250 cycles	B

Remark: EUT shut down when short interruption test was applied, and it could restart by itself.

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3 Test Equipment Information

3.1 General Test Equipment Used

Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
Receiver	R&S	ESR7	TW/C-003	2023.09.25
LISN	Schwarzbeck	NSLK8127	TW/C-013	2023.09.25
LISN	Schwarzbeck	ENV4200	TW/C-040	2023.03.17
LISN	Schwarzbeck	PVDC8301	TW/C-063	2023.12.19

Radiated Emission Test（SAC-3 area）

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
Receiver	Rohde & Schwarz	ESR7	TW/C-003	2023.09.25
Antenna	Schwarzbeck	VULB9168	TW/C-004	2023.12.04
Antenna	Schwarzbeck	BBHA9120D	TW/C-005	2023.12.04

Electrostatic Discharge Test(ESD area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
ESD Generator	Haefely	ONYX30	TW/C-025	2023.09.25

Radiated Immunity Test (SAC-3 area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
Signal Generator	Rohde&Schwarz	SMB100A	TW/C-017	2023.09.25
Amplifer	RFLIGHT	NTWPA-008101000500E	TW/C-015	2023.09.25
Antenna	RFLIGHT	NTWPA-1060100E	TW/C-016	2023.09.25
Amplifer	Schwarzbeck	STLP9128D	TW/C-019	2024.03.17
Horn Antenna	Schwarzbeck	BBHA9120D	TW/C-005	2023.12.04
Power Meter	Rohde&Schwarz	NRP6A	TW/C-018-1	2023.09.25
Power Meter	Rohde&Schwarz	NRP6A	TW/C-018-2	2023.09.25
Field Probe	Narda	EP601	TW/C-037	2023.09.25

Electrical Fast Transients Test(EMS area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
Surge & EFT Generator	EMTEST	AXOS5	TW/C-026-1	2023.09.25
Capacitive coupling Clamp	EMTEST	IP4B	TW/C-026-3	2023.09.25
3-phase EFT CDN	EMTEST	CDN-4100	TW/C-042	2023.03.17

Surges Test(EMS area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
Surge & EFT Generator	Haefely	AXOS5	TW/C-026-1	2023.09.25
3-phase Surge CDN	3ctest	SGN-20	TW/C-041	2023.03.17

Conducted Immunity Test(EMS area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
Signal Generator	Rohde&Schwarz	SMB100A	TW/C-017	2023.09.25
Amplifer	RFLIGHT	NTWPA-4k04200E	TW/C-021	2023.09.25
Attenuator	Ruiming microwave	100W6dB	TW/C-035	2023.09.25
CDN	CYBERTEK	EM5070A	TW/C-033	2023.09.25
Power meter	FCC	F-120-6A	TW/C-022	2023.09.25
Power meter	Rohde&Schwarz	NRP6A	TW/C-018-1	2023.09.25
Signal Generator	Rohde&Schwarz	NRP6A	TW/C-018-2	2023.09.25

Variation of power frequency Test (EMS area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
3-Phase Voltage Dips Simulator	Skylarks	CSS-30P3	TW/C-045	2024.03.22
Surge & EFT Generator	Haefely	AXOS5	TW/C-026-1	2023.09.25

Power-frequency magnetic field Test(EMS area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	CAL. DUE DATE
PFMF Generator	Skylarks	PFM-1000	TW/C-038	2023.09.25

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4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz	3.8dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 2.8dB; Vertical: 2.8dB
Uncertainty for Radiated Emission in 10m chamber 1000MHz-6000MHz	Horizontal: 2.4dB; Vertical: 2.4dB

Remark:
Measurement Uncertainty Decision Rule
Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

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5 Photographs

Details of:

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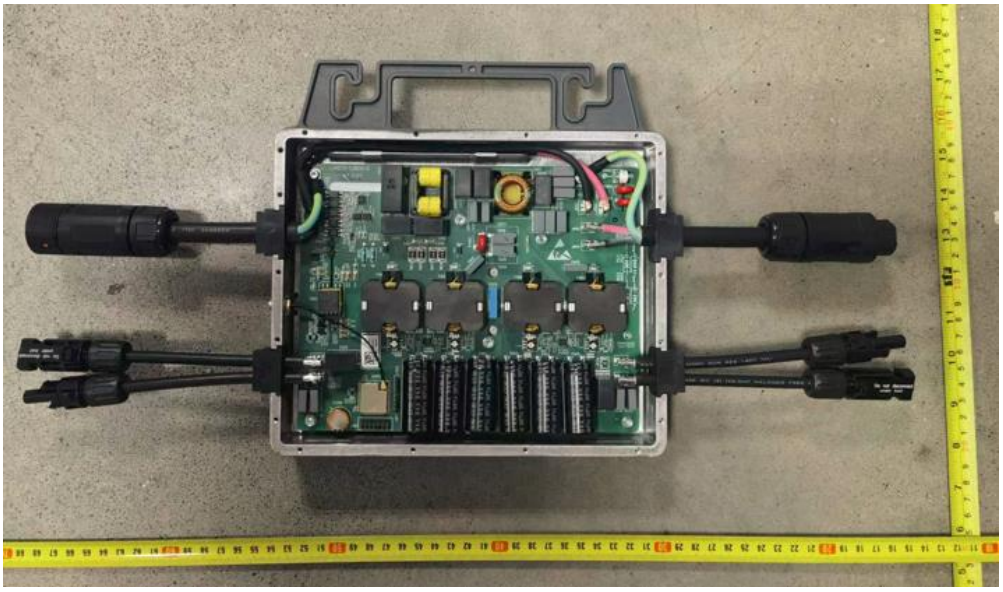

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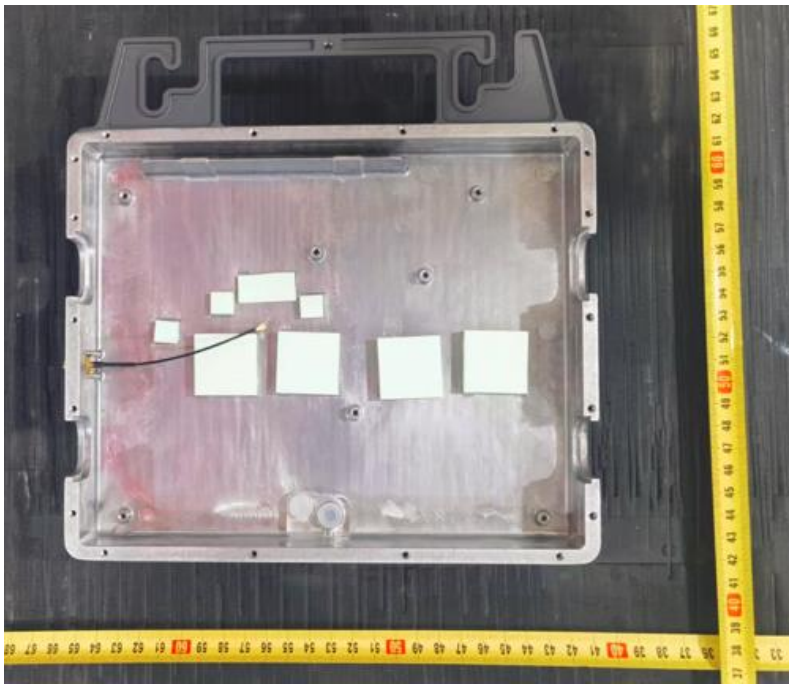

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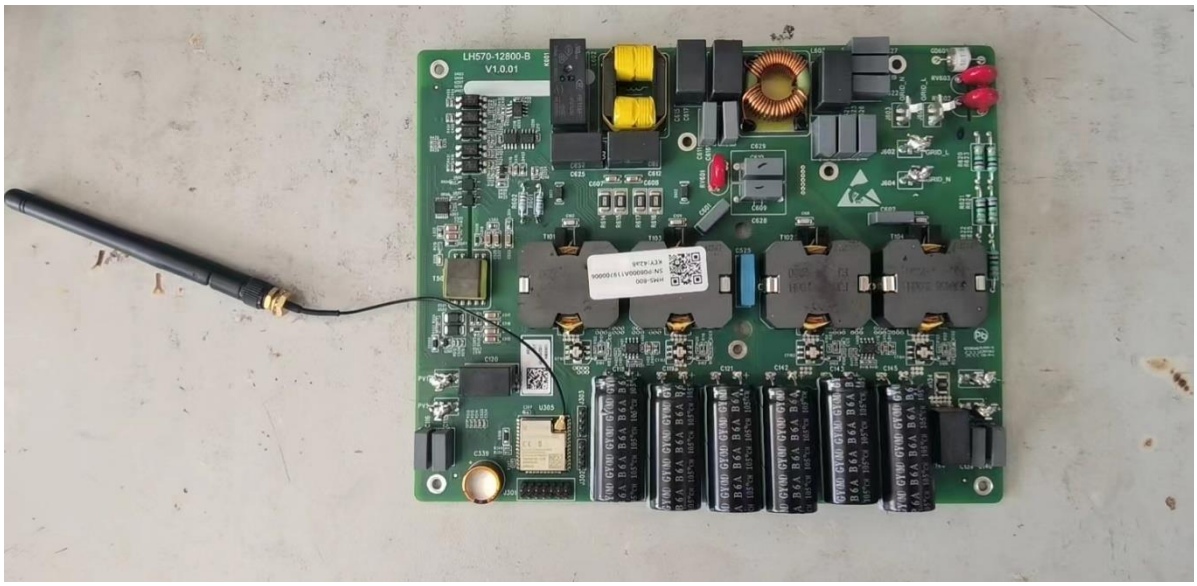

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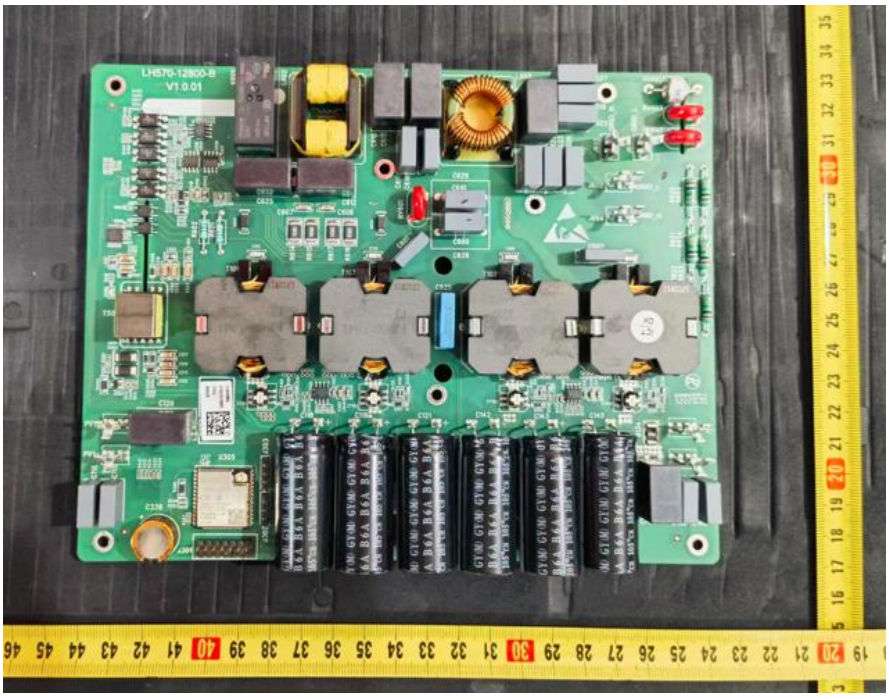

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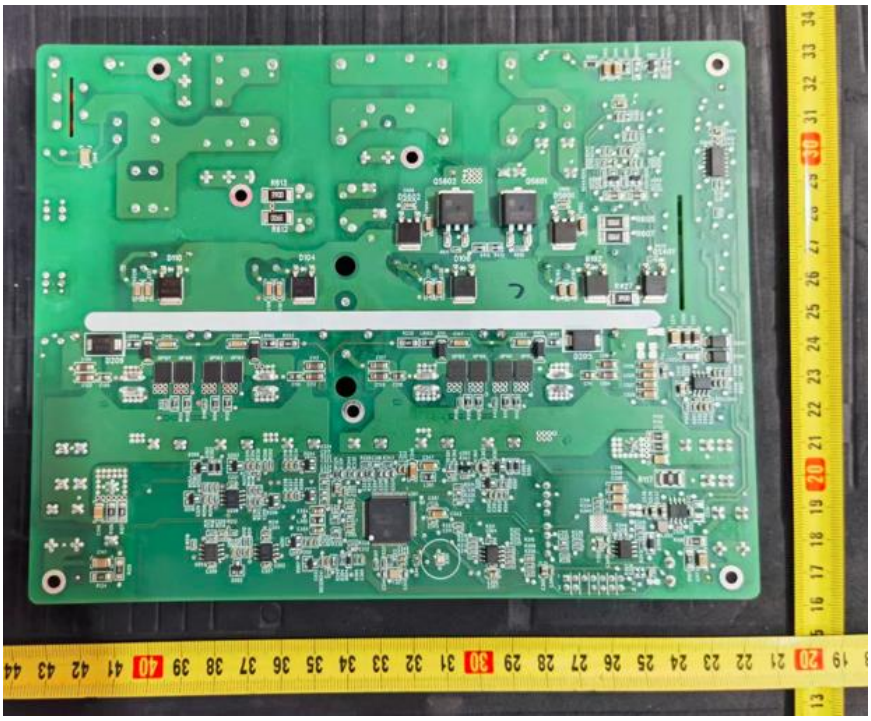

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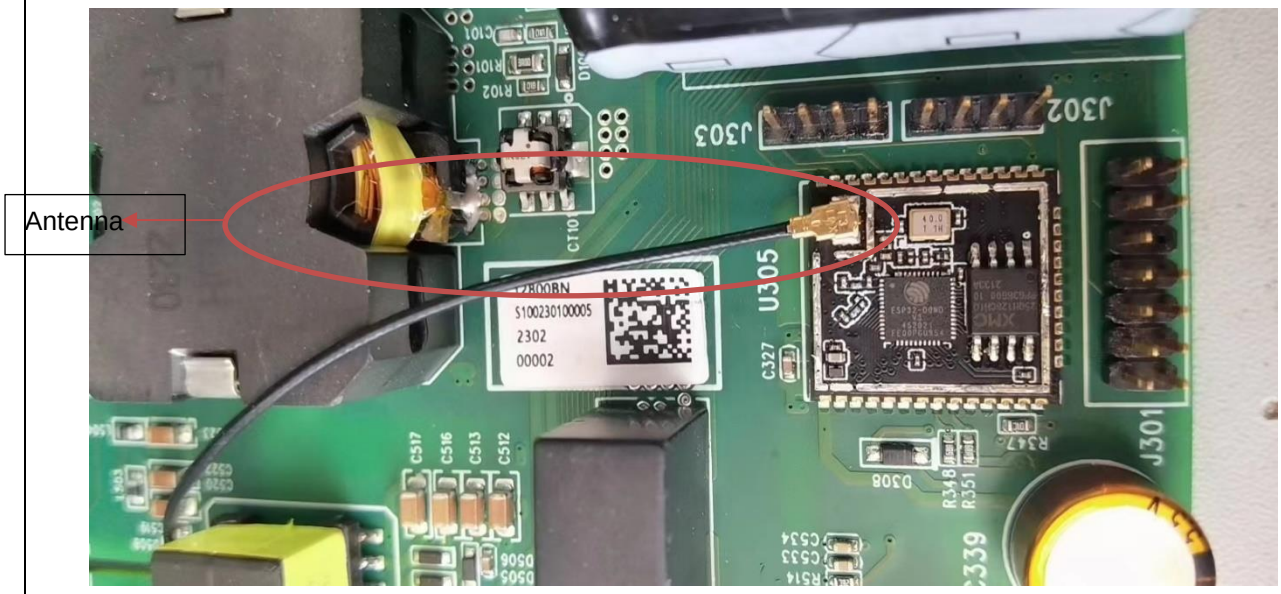

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