

EMC TEST REPORT

Report No.: SET2022-05809

Product: 100W flexible solar panel

Trade name ECOFLOW

Model No. : EF-Flex-M100

Applicant: EcoFlow Inc.

Issued by: CCIC Southern Testing Co., Ltd.

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1 General Information

1.1 Description of EUT

Product: 100W flexible solar panel

Model No.: EF-Flex-M100

Rating: 100W, 17.1VDC, 5.9A

AC ADAPTER: /

I/O Port: /

Accessories: /

Note:

1. The EUT is class B multimedia equipment according to EN55032. For more detailed features description about the EUT, please refer to User’s Manual.

1.2 Auxiliary equipment

Name	Model	Manufacturer	Serial No.	Instrument No.
/	/	/	/	/

1.3 Objective

Perform Electromagnetic Interference (EMI) and Electromagnetic Susceptibility (EMS) tests for CE Marking.

1.4 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

1.5 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in Measurement” (GUM) published by ISO.

- Uncertainty of Radiated Emission(30MHz-1GHz), $U_c = \pm 5.8\text{dB}$

1.6 Test Standards and Results

The EUT has been tested according to the following specifications:

EMISSION		
Standard	Test Type	Result
EN 55032:2015/A11:2020	Radiated disturbance	PASS
IMMUNITY (EN 55035:2017/A11:2020)		
Basic Standard	Test Type	Result
IEC 61000-4-2:2008	Electrostatic discharge immunity	PASS
IEC 61000-4-3:2020	Radiated, radio frequency electromagnetic field immunity	PASS

1.7 List of Equipments Used

Description	Manufacturer	Model No.	Cal. Due Date	Serial No.
Test Receiver	ROHDE&SCHWARZ	ESCI	May. 23, 2022	A0902601
Broadband Ant.	ETC	MCTD2786	Dec. 28, 2022	A150402239
Anechoic Chamber	Albatross	SAC-3MAC(9*6*6)	Mar. 25, 2023	A0412375
Anechoic Chamber	Albatross	SAC-5MAC(EMC 12.8*6.8*6.4m)	Mar. 24, 2023	A0304210
ESD Test System	TESQ	NSG-437	Oct. 07, 2022	A170902745
Signal Generator	ROHDE&SCHWARZ	SMB100A	Dec. 22, 2022	A180502936
Power Amplifier	MILMEGA	80RF1000-250	Sep. 21, 2023	A140901925
Power Amplifier	Rflight	NTWPA-1060200	Jul. 20, 2022	A181203431
Stacked log periodic antenna	SCHWARZEBCK	STLP 9129	Nov. 20, 2023	A181203430
power meter	Agilent	E4417A	Aug. 29, 2022	A151102418

NOTE: Equipments above have been calibrated and are in the period of validation.

2 Emission Test

2.1 EUT Setup and Operation

During the tests, the EUT was working at normal working state.

2.2 Radiated disturbance

2.2.1 Limits of Radiated Disturbance

Frequency range (MHz)	Quasi peak limits(dB(μ V/m)), for Class B MME, at 3m measurement distance
30 – 230	40
230 – 1000	47

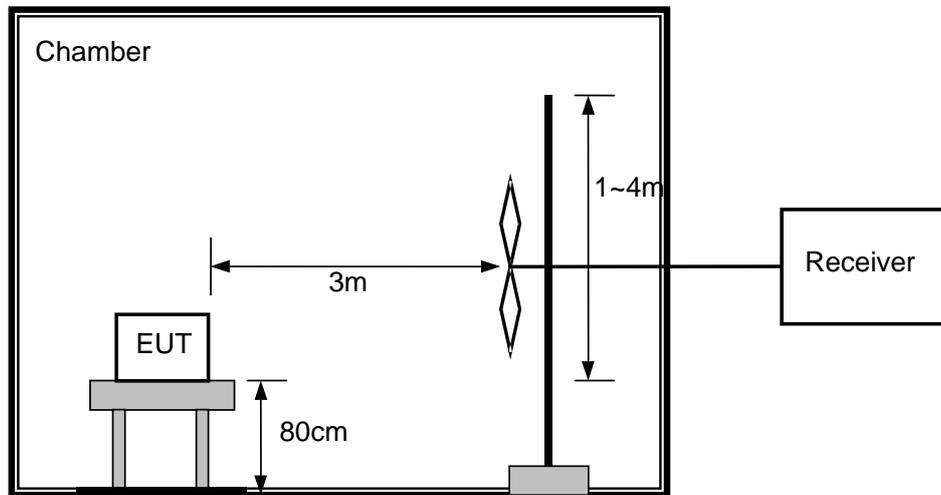
Notes:

- (1) The lower limit shall apply at the transition frequency.
- (2) Additional provisions may be required for cases where interference occurs.

2.2.2 Test Procedure

- a. The EUT was placed on the top of an insulating table 0.8 meters above the ground at a semi-anechoic chamber. 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 antenna is a broadband antenna, and its height is varied from 1 to 4 meter 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 the heights from 1 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 Peak Detector Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emission that did not have 10dB margin would be retested one by one using the quasi-peak method.

2.2.3 Test Setup

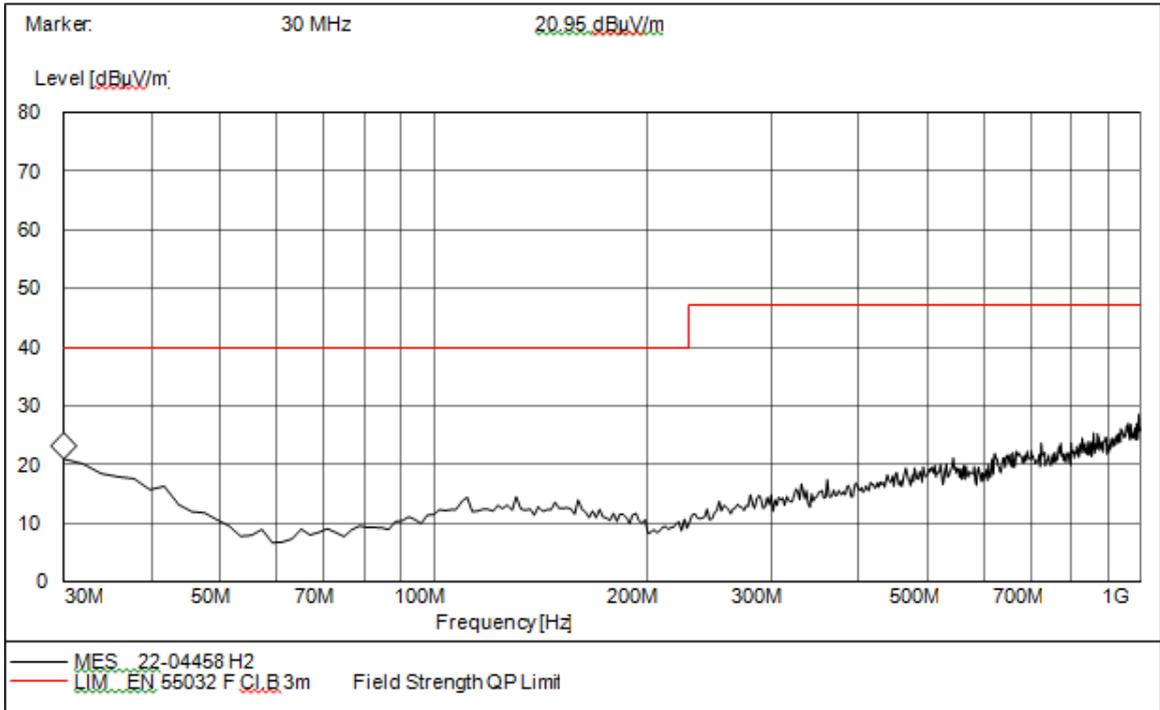


For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

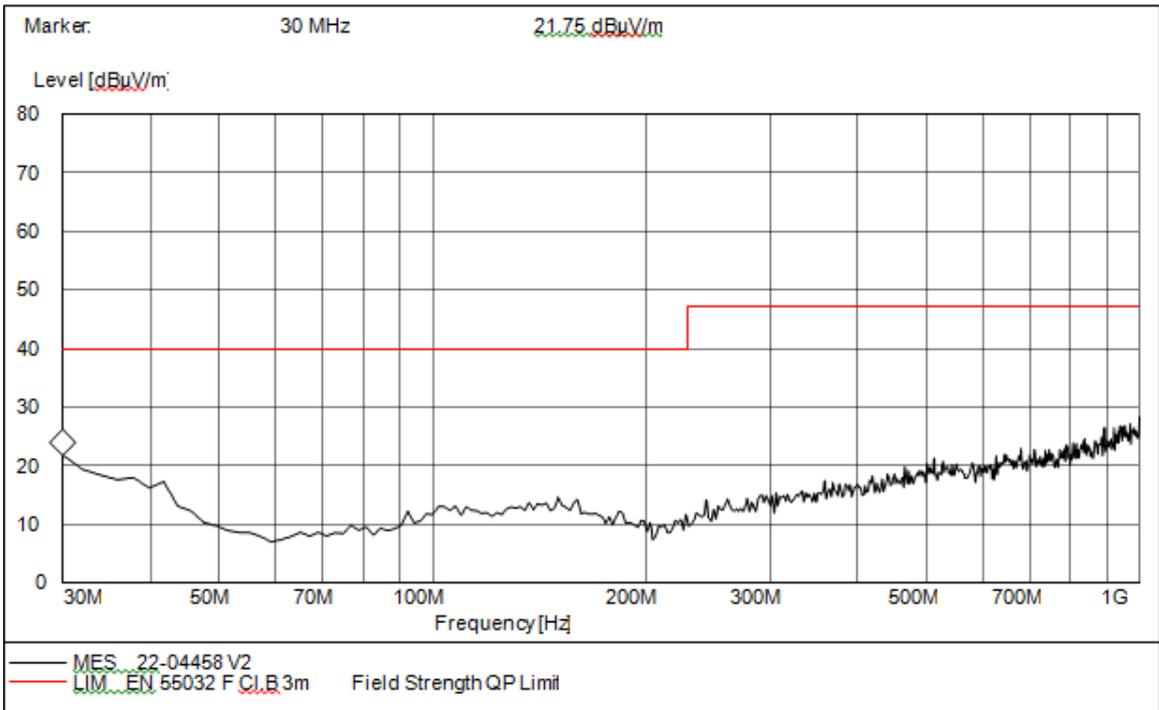
2.2.4 Test Result

No.	Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	QP Limits (dB(μV/m))	Emission Level (dB(μV/m))
1	30-230	H/V	100-400	0-360	40	<30
2	230-1000	H/V	100-400	0-360	47	<30

1. Radiation disturbances, antenna polarization: Horizontal



2. Radiation disturbances, antenna polarization: Vertical



3 Immunity Test

3.1 EUT Setup and Operating Conditions

Same as 2.1.

3.2 Performance Criteria

Criterion A	The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
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.
Criterion C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

3.3 Electrostatic Discharge Immunity Test

3.3.1 Test Specification

Basic Standard:	IEC 61000-4-2
Discharge Impedance	330 Ω / 150 Pf
Discharge Voltage:	Air Discharge :2 kV, 4 kV, 8 kV Contact Discharge : 2 kV, 4 kV
Polarity:	Positive / Negative
Discharge Mode:	Single discharge
Discharge Period:	1-second minimum

3.3.2 Test Procedure

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 contact test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, 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.

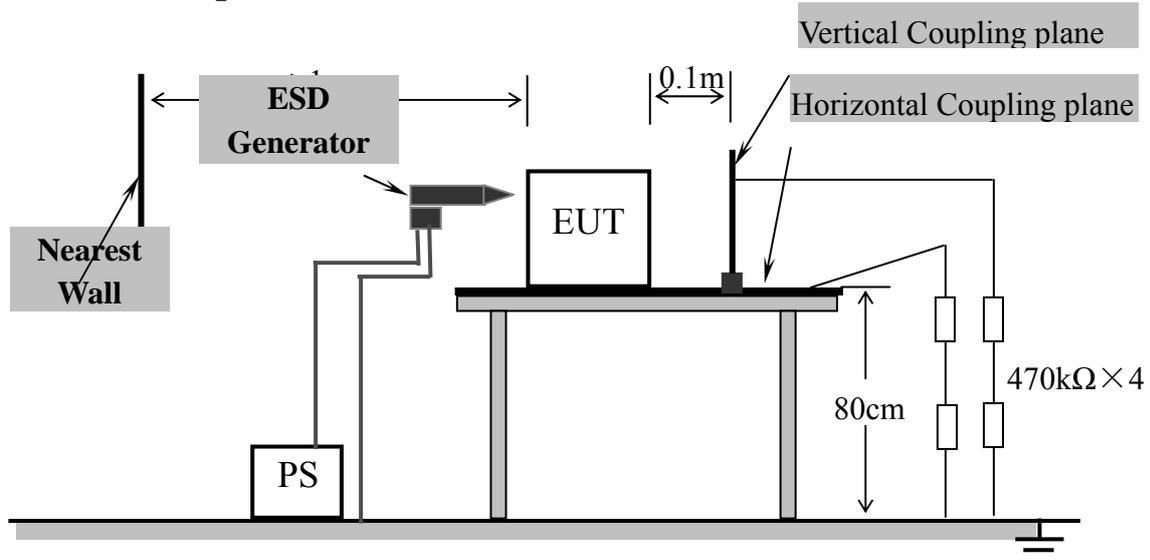
Air discharges at slots and apertures and insulating surfaces:

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 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 ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- 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 completed.
- g. At least 10 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 vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.
- h. At least 10 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×0.5m) was placed vertically to and 0.1 meters from the EUT.

3.3.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

3.3.4 Test Result

Test Points	Discharge Level (Kv)	Discharge Mode	Observation	Comply with Criterion
Aperture of the cover	±2, ±4, ±8	Air	Note(1)	A
HCP	±2, ±4	Contact	Note(1)	A
VCP	±2, ±4	Contact	Note(1)	A

NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.

3.4 Radiated, Radio Frequency Electromagnetic Field Immunity Test

3.4.1 Test Specification

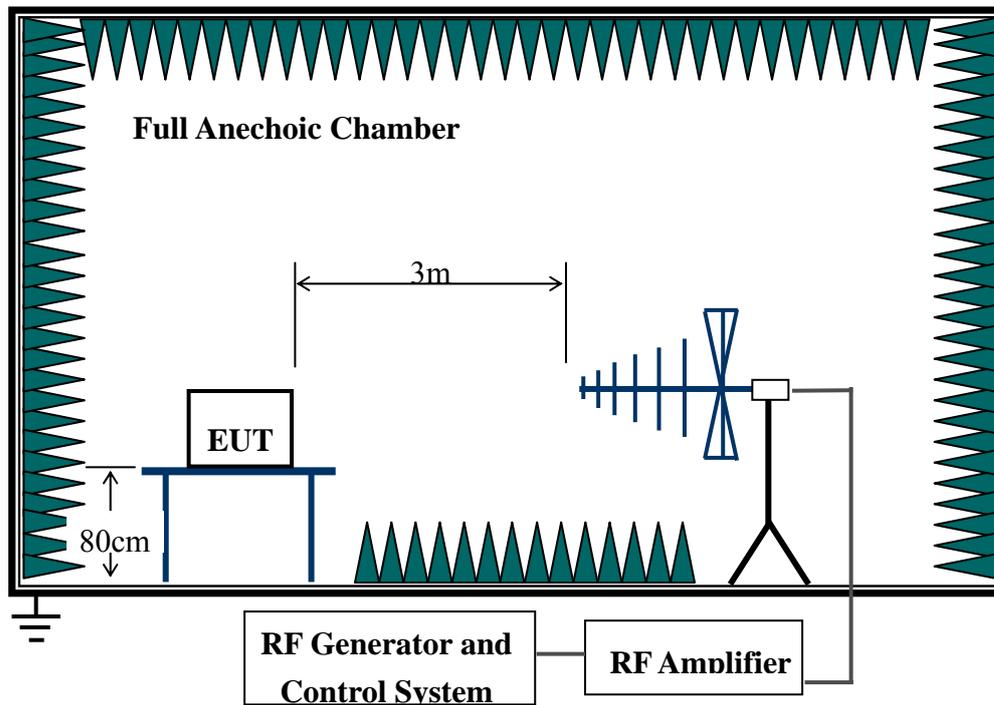
Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz – 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz
Field Strength:	3V/m
Modulation:	1kHz sine wave, 80%, AM modulation
Frequency Step:	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance:	3m
Antenna Height:	1.5m
Dwell Time:	1 second

3.4.2 Test Procedure

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

- a. The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b. The frequency range is swept from 80 MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The field strength level was 3V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

3.4.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

3.4.4 Test Result

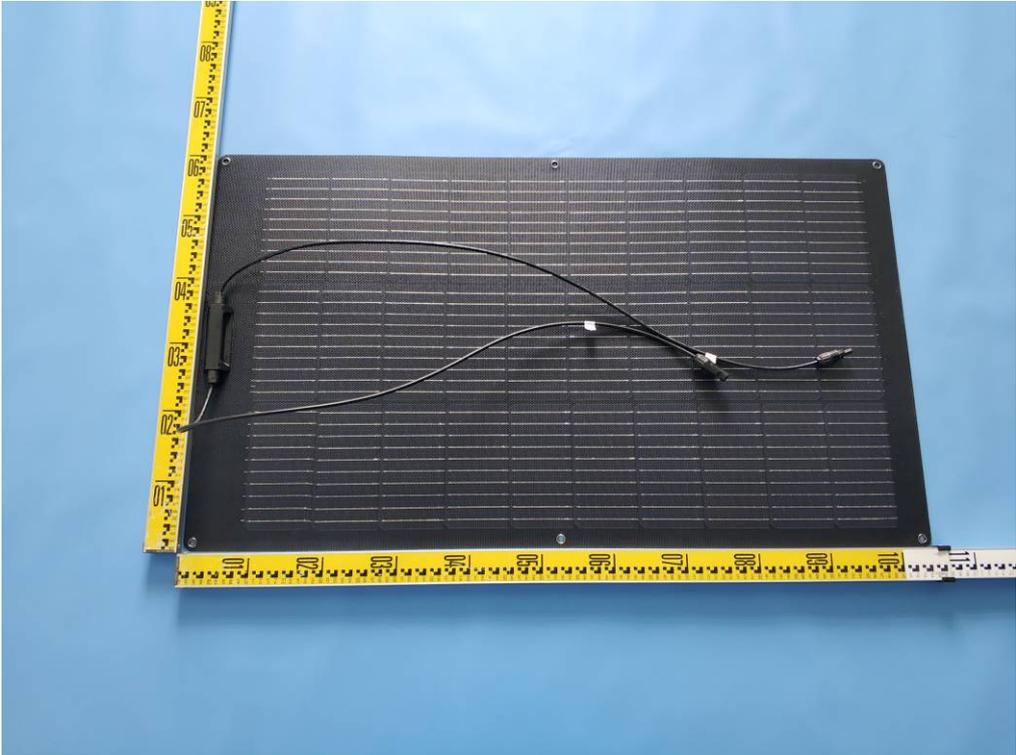
Frequency	Polarity	Azimuth	Field Strength (V/m)	Observation	Comply with Criterion
80-1000 MHz	V&H	0	3	Note(1)	A
80-1000 MHz	V&H	90	3	Note(1)	A
80-1000 MHz	V&H	180	3	Note(1)	A
80-1000 MHz	V&H	270	3	Note(1)	A
1800 MHz	V&H	0	3	Note(1)	A
1800 MHz	V&H	90	3	Note(1)	A
1800 MHz	V&H	180	3	Note(1)	A
1800 MHz	V&H	270	3	Note(1)	A
2600 MHz	V&H	0	3	Note(1)	A
2600 MHz	V&H	90	3	Note(1)	A
2600 MHz	V&H	180	3	Note(1)	A
2600 MHz	V&H	270	3	Note(1)	A
3500 MHz	V&H	0	3	Note(1)	A
3500 MHz	V&H	90	3	Note(1)	A
3500 MHz	V&H	180	3	Note(1)	A
3500 MHz	V&H	270	3	Note(1)	A

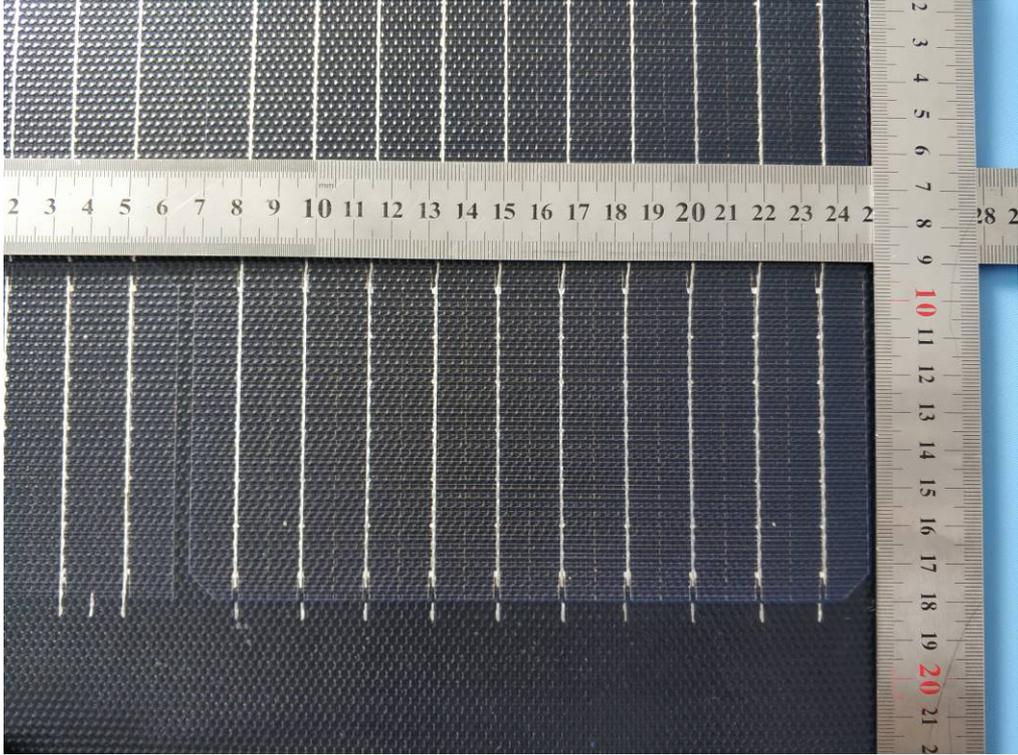
5000 MHz	V&H	0	3	Note(1)	A
5000 MHz	V&H	90	3	Note(1)	A
5000 MHz	V&H	180	3	Note(1)	A
5000 MHz	V&H	270	3	Note(1)	A

NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.

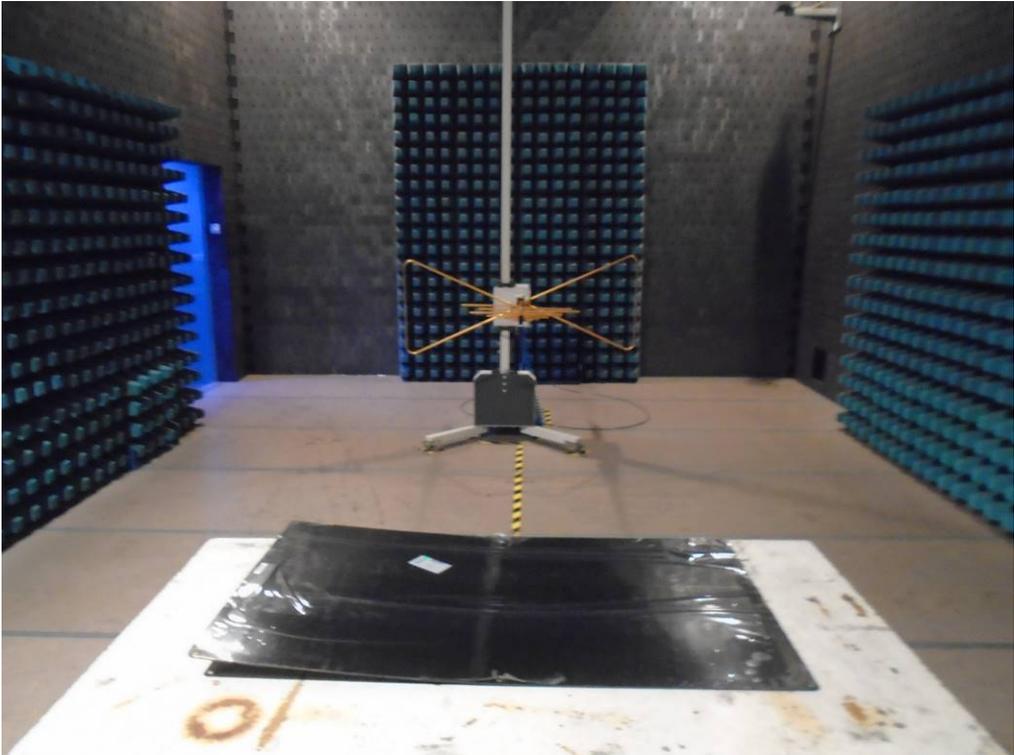
Appendix I: Photographs of the EUT





Appendix II: Photographs of EMC Test Configuration

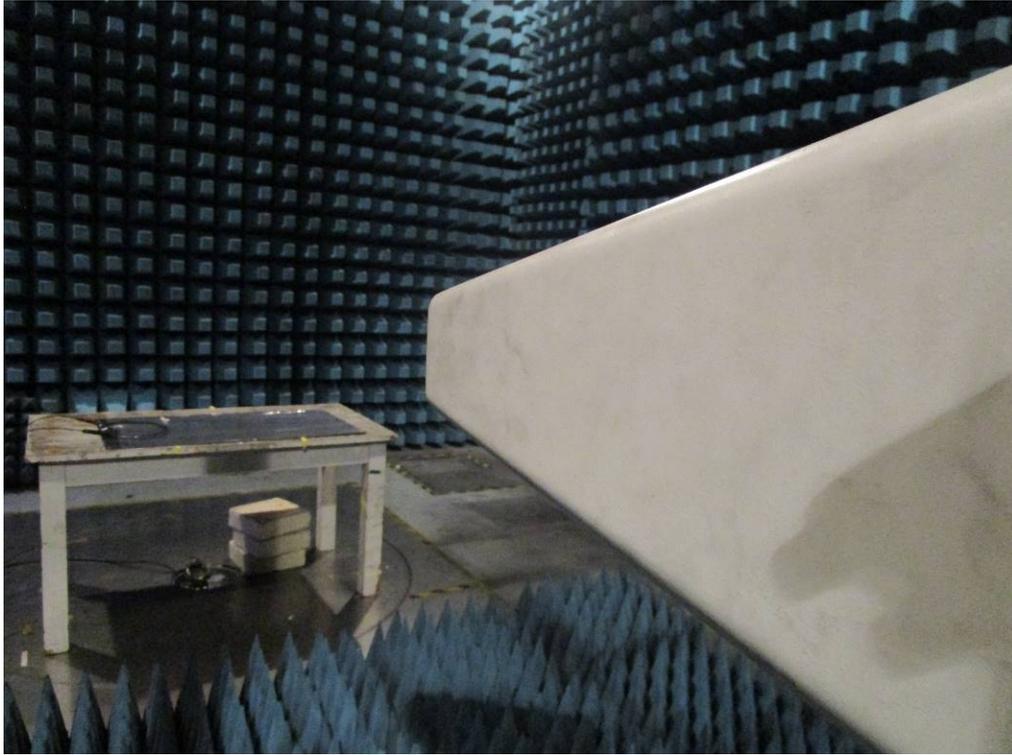
1. Radiated Field Strength Measurement



2. Electrostatic Discharge Immunity Test



3. Radiated, Radio Frequency Electromagnetic Field Immunity Test



End of report

STATEMENT

1. The test report is invalid without stamp of laboratory.
2. The test report is invalid without signature of person(s) testing and authorizing.
3. The test report is invalid if erased and corrected.
4. Test results of the report are valid to the test samples if sampling by client.
5. “☆” item to be outside the scope of authorized by CNAS.
6. The report without the “CMA” stamp shall not have a certifying effect on the society.
7. The test report shall not be reproduced except in full, without written approval of the laboratory.
8. If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

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