

FCC SDoC TEST REPORT

Haverford Systems, Inc.

Keyboard Controller

Test Model: PT-JOY-G4

Additional Model No.: Please Refer To Page 7

Prepared for : Haverford Systems, Inc.
Address : 152 Robbins Road, Downingtown, PA 19335, The United States of America

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample : October 15, 2020
Number of tested samples : 1
Serial number : Prototype
Date of Test : October 15, 2020 ~ October 27, 2020
Date of Report : November 17, 2020



FCC SDoC TEST REPORT
FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014

Report Reference No. : LCS201015033AE

Date Of Issue : November 17, 2020

Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Testing Location/ Procedure... : Full application of Harmonised standards ■
Partial application of Harmonised standards □
Other standard testing method □

Applicant's Name..... : Haverford Systems, Inc.

Address : 152 Robbins Road, Downingtown, PA 19335, The United States of America

Test Specification

Standard..... : FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014

Test Report Form No..... : LCSEMC-1.0

TRF Originator..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

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Test Item Description. : Keyboard Controller

Test Model : PT-JOY-G4

Trade Mark : PTZOptics, HuddleCam

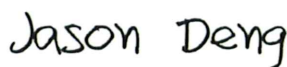
Ratings : DC 12V, 2A

Result : Positive

Compiled by:

Emma Wang/ File
administrators

Supervised by:



Jason Deng/ Technique principal

Approved by:



Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS201015033AE

November 17, 2020

Date of issue

Test Model : PT-JOY-G4

EUT..... : Keyboard Controller

Applicant..... : Haverford Systems, Inc.

Address..... : 152 Robbins Road, Downingtown, PA 19335, The United States of America

Telephone..... : /

Fax..... : /

Manufacturer..... : Shenzhen Mingyang Ages Electronics Co., LTD

Address..... : 1-2F, Building 7, Dongwu Industrial Zone, Donghuan 1st Rd, Longhua District, shenzhen, China

Telephone..... : /

Fax..... : /

Factory..... : Shenzhen Mingyang Ages Electronics Co., LTD

Address..... : 1-2F, Building 7, Dongwu Industrial Zone, Donghuan 1st Rd, Longhua District, shenzhen, China

Telephone..... : /

Fax..... : /

Test Result according to the standards on page 6: **Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	November 17, 2020	Initial Issue	Gavin Liang

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1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted disturbance at mains terminals	FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014	Class B	PASS
Radiated disturbance	FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014	Class B	PASS
N/A is an abbreviation for Not Applicable.			

Test mode:

Mode 1	Working	Record
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2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT : Keyboard Controller

Trade Mark : PTZOptics, HuddleCam

Test Model : PT-JOY-G4

Model Lists : PT-JOY-G3, HC-JOY-G3, PT-SUPERJOY-G1

Model declaration : PCB board, structure and internal of these model(s) are the same, So no additional models were tested.

Power Supply : DC 12V, 2A

Highest internal frequency (Fx)	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5 GHz
$F_x > 1 \text{ GHz}$	$5 \times F_x$ up to a maximum of 6 GHz
NOTE 1 For FM and TV broadcast receivers, Fx is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies. Where Fx is unknown, the radiated emission measurements shall be performed up to 6 GHz.	

2.2. Support equipment List

Name	Manufacturers	M/N	S/N
--	--	--	--

2.3. Description of Test Facility

Site Description
EMC Lab. : NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.

2.4. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

2.5. Measurement Uncertainty

Test	Parameters	Expanded Uncertainty (Ulab)	Expanded Uncertainty (Ucisp)
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 2.63 dB ± 2.35 dB	± 3.8 dB ± 3.4 dB
Power Disturbance	Level accuracy (30MHz to 300MHz)	± 2.90 dB	± 4.5 dB
Electromagnetic Radiated Emission (3-loop)	Level accuracy (9kHz to 30MHz)	± 3.60 dB	± 3.3 dB
Radiated Emission	Level accuracy (9kHz to 30MHz)	± 3.68 dB	N/A
Radiated Emission	Level accuracy (30MHz to 1000MHz)	± 3.48 dB	± 5.3 dB
Radiated Emission	Level accuracy (above 1000MHz)	± 3.90 dB	± 5.2 dB
Mains Harmonic	Voltage	$\pm 0.510\%$	N/A
Voltage Fluctuations & Flicker	Voltage	$\pm 0.510\%$	N/A
EMF		$\pm 21.59\%$	N/A

(1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

(2) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

3. TEST RESULTS

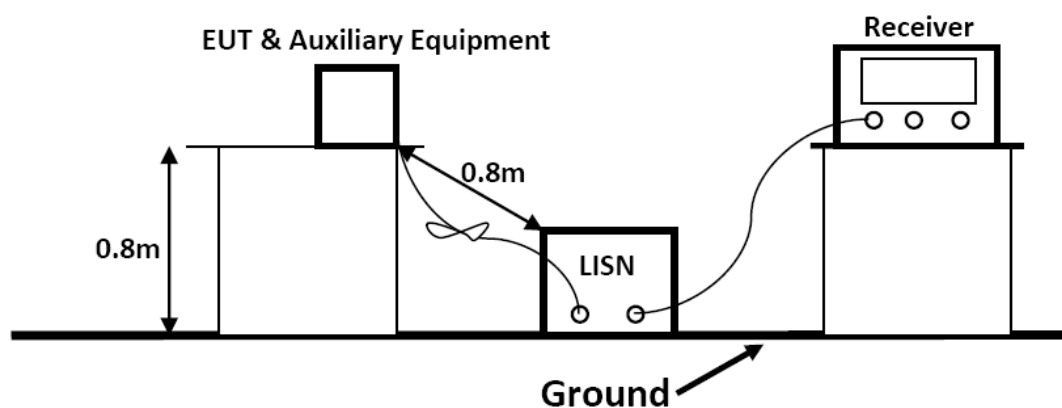
3.1. POWER LINE CONDUCTED EMISSION MEASUREMENT

3.1.1. Test Equipment

The following test equipments are used during the power line conducted measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	EZ	EZ-EMC	/	N/A	N/A
2	EMI Test Receiver	R&S	ESPI	101840	2020-06-22	2021-06-21
3	Artificial Mains	R&S	ENV216	101288	2020-06-22	2021-06-21
4	10dB Attenuator	SCHWARZBEC K	MTS-IMP-136	261115-001-0032	2020-06-22	2021-06-21

3.1.2. Block Diagram of Test Setup



3.1.3. Test Standard

Power Line Conducted Emission Limits (Class B)

Frequency (MHz)			Limit (dB μ V)	
			Quasi-peak Level	Average Level
0.15	~	0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50	~	5.00	56.0	46.0
5.00	~	30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.

NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

3.1.4. EUT Configuration on Test

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

3.1.5. Operating Condition of EUT

3.1.5.1. Setup the EUT as shown on Section 3.1.2

3.1.5.2. Turn on the power of all equipments.

3.1.5.3. Let the EUT work in measuring Mode 1 and measure it.

3.1.6. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC/ANSI C63.4-2014 on Conducted Emission Measurement.

The bandwidth of the test receiver is set at 9kHz.

The frequency range from 150kHz to 30MHz is investigated

3.1.7. Test Results

PASS.

The test result please refer to the next page.

Test Model	PT-JOY-G4	Test Mode	Working
Environmental Conditions	23.3℃, 53.7% RH	Test Engineer	Zq Pang
Pol	Line	Test Voltage	AC 120V/60Hz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1814	23.49	19.17	42.66	64.42	-21.76	QP
2	0.1859	11.28	19.17	30.45	54.22	-23.77	AVG
3	0.3930	23.61	19.31	42.92	58.00	-15.08	QP
4	0.4063	9.95	19.32	29.27	47.72	-18.45	AVG
5	1.2209	19.67	19.28	38.95	56.00	-17.05	QP
6	1.2523	6.52	19.29	25.81	46.00	-20.19	AVG
7	2.3054	15.29	19.42	34.71	56.00	-21.29	QP
8	2.3864	2.64	19.43	22.07	46.00	-23.93	AVG
9	5.6174	13.06	19.52	32.58	60.00	-27.42	QP
10	5.7794	-2.75	19.52	16.77	50.00	-33.23	AVG
11	11.4674	11.03	19.82	30.85	60.00	-29.15	QP
12	11.7464	-3.36	19.84	16.48	50.00	-33.52	AVG

Test Model	PT-JOY-G4	Test Mode	Working
Environmental Conditions	23.3℃, 53.7% RH	Test Engineer	Zq Pang
Pol	Neutral	Test Voltage	AC 120V/60Hz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1905	29.81	19.17	48.98	64.01	-15.03	QP
2	0.3930	29.78	19.31	49.09	58.00	-8.91	QP
3	0.7934	21.75	19.30	41.05	56.00	-14.95	QP
4	1.5044	21.22	19.33	40.55	56.00	-15.45	QP
5	3.7185	17.27	19.46	36.73	56.00	-19.27	QP
6	9.0285	13.94	19.65	33.59	60.00	-26.41	QP
7	0.1954	11.48	19.18	30.66	53.80	-23.14	AVG
8	0.4083	11.95	19.32	31.27	47.68	-16.41	AVG
9	0.8339	9.56	19.29	28.85	46.00	-17.15	AVG
10	1.5900	8.50	19.34	27.84	46.00	-18.16	AVG
11	3.9570	1.86	19.46	21.32	46.00	-24.68	AVG
12	9.4560	-0.14	19.67	19.53	50.00	-30.47	AVG

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

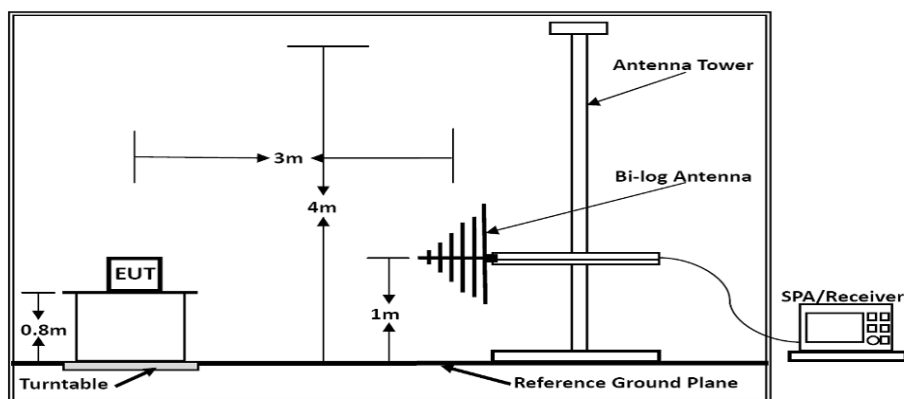
3.2. Radiated emission Measurement

3.2.1. Test Equipment

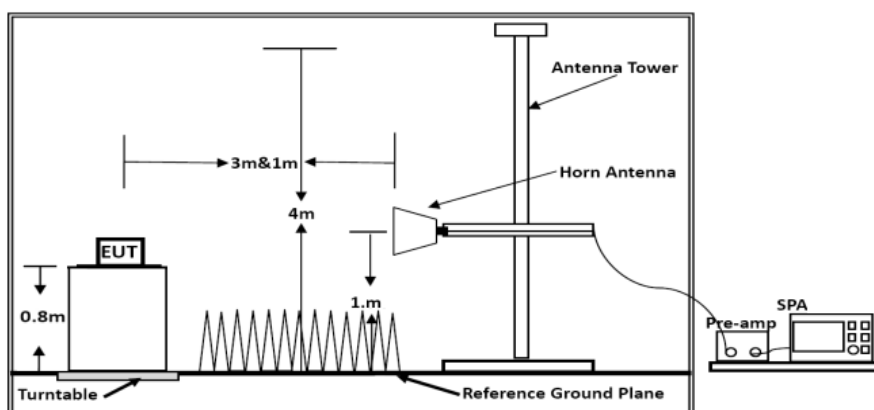
The following test equipments are used during the radiated emission measurement:

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	EZ	EZ-EMC	/	N/A	N/A
2	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2021-07-25
3	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018-07-02	2021-07-01
4	EMI Test Receiver	R&S	ESR 7	101181	2020-06-22	2021-06-21
5	Broadband Preamplifier	/	BP-01M18G	P190501	2020-06-22	2021-06-21

3.2.2. Block Diagram of Test Setup



Below 1GHz



Above 1GHz

3.2.3. Radiated Emission Limit (Class B)

Limits for Radiated Disturbance Below 1GHz

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46
960 ~ 1000	3	500	54
Remark: (1) Emission level $(\text{dB})\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$ (2) The smaller limit shall apply at the cross point between two frequency bands. (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.			
Limits for Radiated Emission Above 1GHz			
Frequency (MHz)	Distance (Meters)	Peak Limit ($\text{dB}\mu\text{V/m}$)	Average Limit ($\text{dB}\mu\text{V/m}$)
Above 1000	3	74	54
***Note: The lower limit applies at the transition frequency.			

3.2.4. EUT Configuration on Measurement

The following equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

3.2.5. Operating Condition of EUT

3.2.5.1. Setup the EUT as shown in Section 3.2.2.

3.2.5.2. Let the EUT work in test Mode 1 and measure it.

3.2.6. Test Procedure

EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated by-log antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4-2014 on radiated emission measurement.

The bandwidth of the EMI test receiver is set at 120kHz, 300kHz.

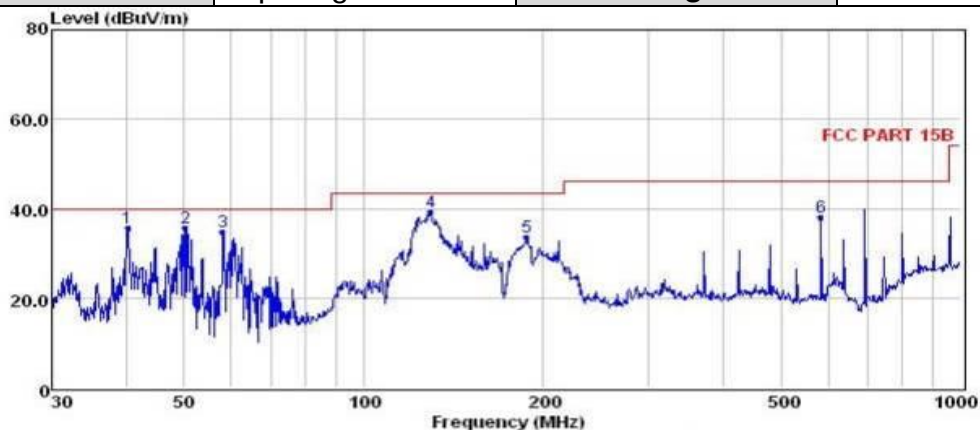
The frequency range from 30MHz to 1000MHz is checked.

3.2.7. Radiated Emission Noise Measurement Result

PASS.

The scanning waveforms please refer to the next page.

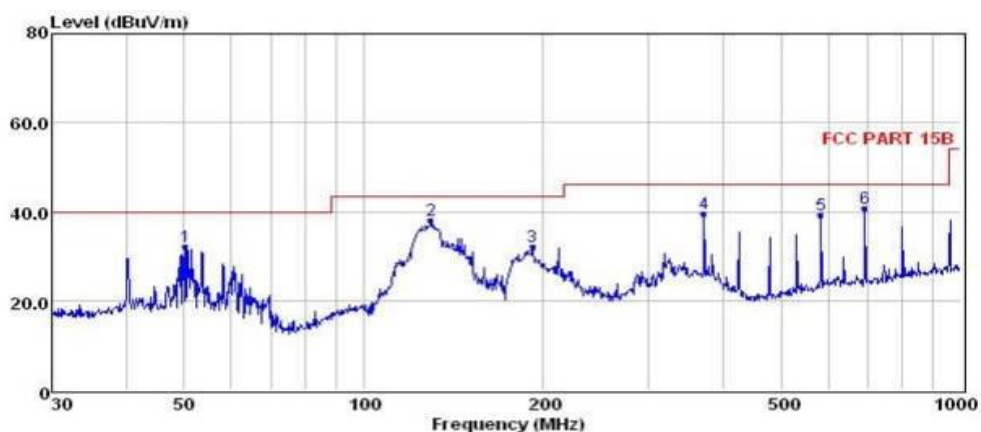
Test Model	PT-JOY-G4	Test Mode	Working
Environmental Conditions	22.1℃, 53.2% RH	Detector Function	Quasi-peak
Pol	Vertical	Distance	3m
Test Engineer	Zq Pang	Test Voltage	AC 120V/60Hz



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	40.28	21.63	0.38	13.58	35.59	40.00	-4.41	Peak
2	50.23	21.80	0.54	13.24	35.58	40.00	-4.42	Peak
3	58.00	21.59	0.47	12.82	34.88	40.00	-5.12	Peak
4	129.47	29.52	0.67	9.01	39.20	43.50	-4.30	Peak
5	187.75	22.15	0.98	10.36	33.49	43.50	-10.01	Peak
6	584.79	18.36	1.50	18.17	38.03	46.00	-7.97	Peak

Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission that are 20db below the official limit are not reported

Test Model	PT-JOY-G4	Test Mode	Working
Environmental Conditions	22.1℃, 53.2% RH	Detector Function	Quasi-peak
Pol	Horizontal	Distance	3m
Test Engineer	Zq Pang	Test Voltage	AC 120V/60Hz



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	50.23	18.47	0.54	13.24	32.25	40.00	-7.75	QP
2	129.47	28.27	0.67	9.01	37.95	43.50	-5.55	QP
3	191.75	20.84	0.86	10.56	32.26	43.50	-11.24	QP
4	372.00	23.92	1.20	14.53	39.65	46.00	-6.35	QP
5	584.79	19.72	1.50	18.17	39.39	46.00	-6.61	QP
6	691.99	20.34	1.66	18.78	40.78	46.00	-5.22	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission that are 20db below the official limit are not reported

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

4. PHOTOGRAPH



Photo of Power Line Conducted Measurement

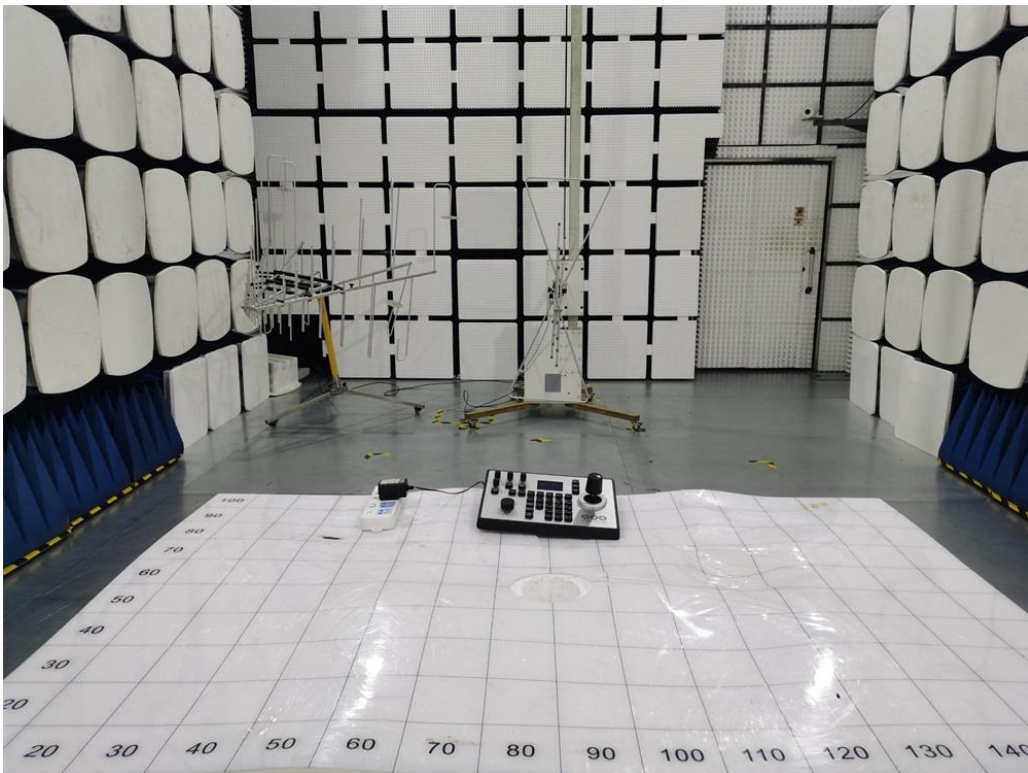


Photo of Radiated emission Measurement

5. EXTERNAL AND INTERNAL PHOTOS OF THE EUT



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7

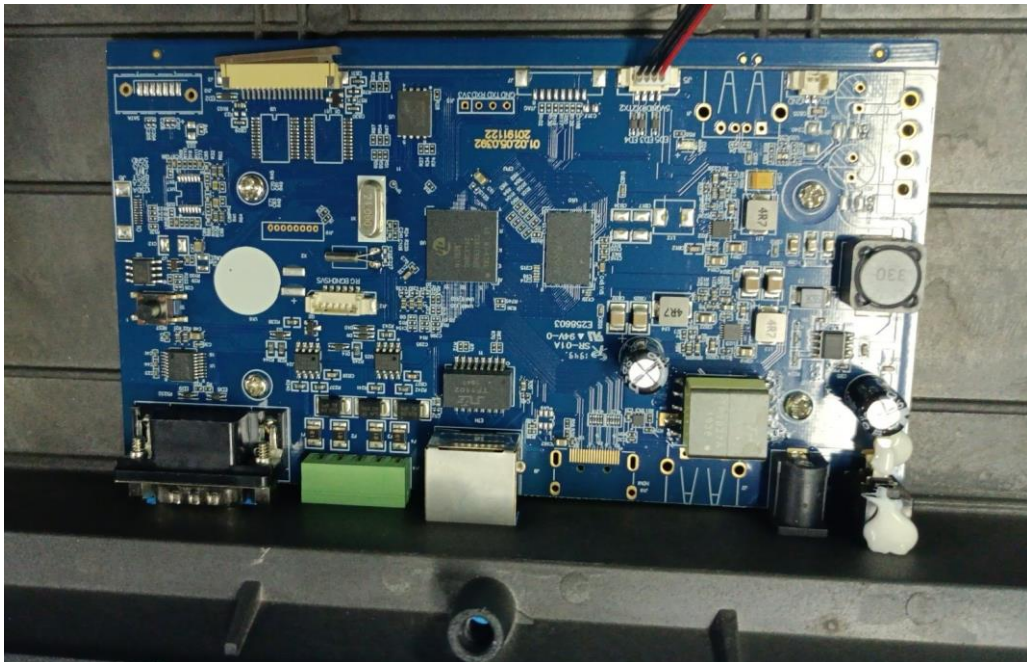


Fig. 8

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