ISED TEST REPORT

(EMC)

Applicant:	Nebra Ltd
Address of Applicant:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Kent, TN3 9BJ, United Kindgom

Equipment Under Test (EUT)

Product Name:	Media Center HAT
Model No.:	v1.1
Applicable standards:	ICES-003 Issue 6 Published: January 2016, Updated: April 2019
Date of sample receipt:	12 Jul., 2019
Date of Test:	12 Jul., to 05 Aug., 2019
Date of report issued:	05 Aug., 2019
Test Result:	PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Bruce Zhang
Laboratory Manager

2 Version

Version No.	Date	Description
00	*05 Aug., 2019*	*Original*

Tested by: Carey Chen ***Date:*** *05 Aug., 2019*

Test Engineer

Reviewed by: Winner Zhang ***Date:*** *05 Aug., 2019*

Project Engineer

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4 Test Summary

Test Item	Section	Result
Conducted Emission	ICES 003 Section 6.1	N/A
Radiated Emission	ICES 003 Section 6.2	Pass

Pass: The EUT complies with the essential requirements in the standard.

5 General Information

5.1 Client Information

Applicant:	Nebra Ltd
Address:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Kent, TN3 9BJ, United Kindgom
Manufacturer:	Nebra Ltd
Address:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Kent, TN3 9BJ, United Kindgom
Factory:	Sunsoar Tech Co. Ltd
Address:	9F, A block, Nanchang Huafeng The Second Industrial Zone, Hangkong Road,Xixiang Town, Bao'an District, Shenzhen City, China

5.2 General Description of E.U.T.

Product Name:	Media Center HAT
Model No.:	v1.1
Power supply:	DC 3.3V-5.0V
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

5.3 Test Mode

Operating mode	Detail description
On mode	Keep the EUT in working mode
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

5.4 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±1.60 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.38 dB (k=2)

5.5 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
Pi supply	Raspberry Pi 3 Model B	Raspberry Pi 3 Model B	N/A	DoC
PIMORONI	Mini Black Hat Hack3r PCB	Mini Black Hat Hack3r	N/A	DoC
RS Components Ltd	Switching Adapter	DSA-13PFC-05 FCA	N/A	N/A

5.6 Related Submittal(s) / Grant (s)

This is an original grant, no related submittals and grants.

5.7 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf

5.8 Laboratory Location

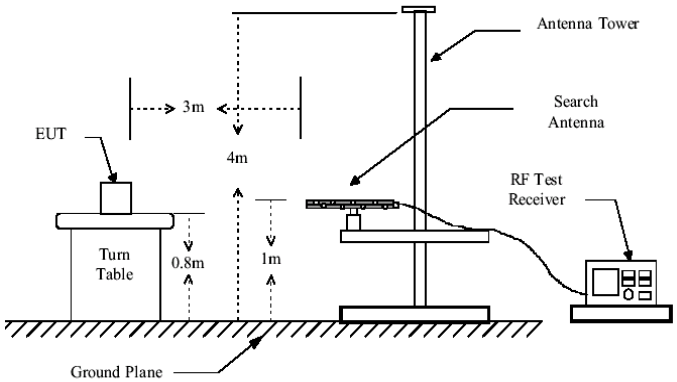
Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

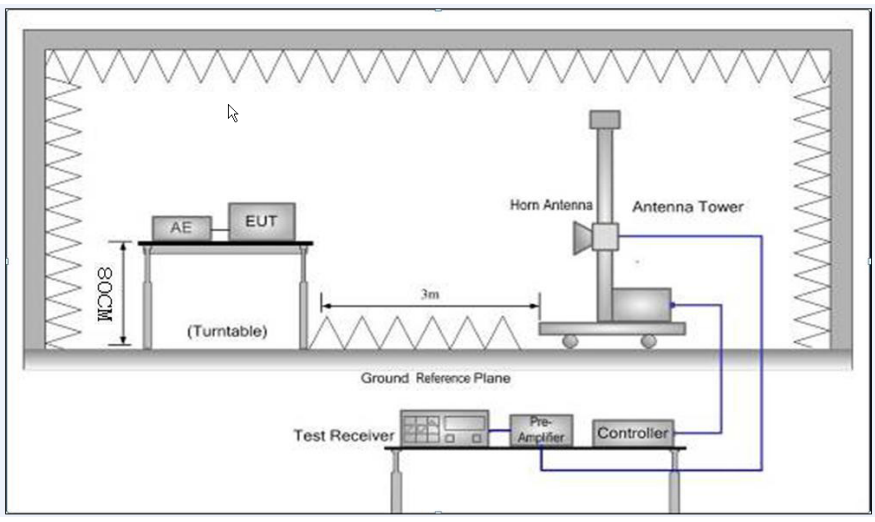
5.9 Test Instruments list

Radiated Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
Loop Antenna	SCHWARZBECK	FMZB1519B	00044	03-18-2019	03-17-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2018	11-20-2019
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-18-2019	03-17-2020
Pre-amplifier	CD	PAP-1G18	11804	03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2018	11-20-2019
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-18-2019	03-17-2020
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-18-2019	03-17-2020
Cable	MICRO-COAX	MFR64639	K10742-5	03-18-2019	03-17-2020
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-18-2019	03-17-2020

6 Test results and Measurement Data

6.1 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td colspan="5">ICES 003 Section 6.2</td></tr>
<tr><td>Test Method:</td><td colspan="5">ANSI C63.4:2014</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="5">Refer to table 3 of ICES 003</td></tr>
<tr><td>Test site:</td><td colspan="5">Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td rowspan="4">Receiver setup:</td><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120kHz</td><td>300kHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
<tr><td rowspan="7">Limit:</td><td colspan="2">Frequency</td><td colspan="2">Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td colspan="2">30MHz-88MHz</td><td colspan="2">40.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">88MHz-216MHz</td><td colspan="2">43.5</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">216MHz-960MHz</td><td colspan="2">46.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">960MHz-1GHz</td><td colspan="2">54.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2" rowspan="2">Above 1GHz</td><td colspan="2">54.0</td><td>Average Value</td></tr>
<tr><td colspan="2">74.0</td><td>Peak Value</td></tr>
<tr><td>Test setup:</td><td colspan="5">Below 1GHz
 

Above 1GHz
 
</td></tr>
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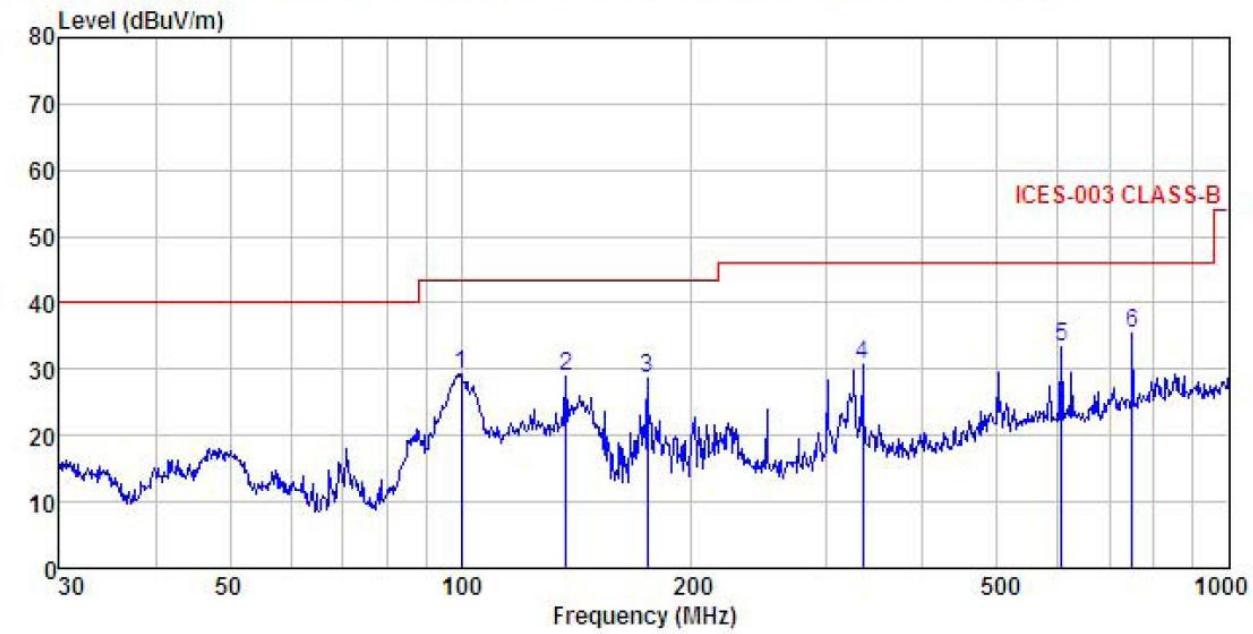
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four 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. 4. 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. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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 emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

Product Name:	Media Center HAT	**Product Model:**	v1.1
Test By:	Carey	**Test mode:**	On Mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

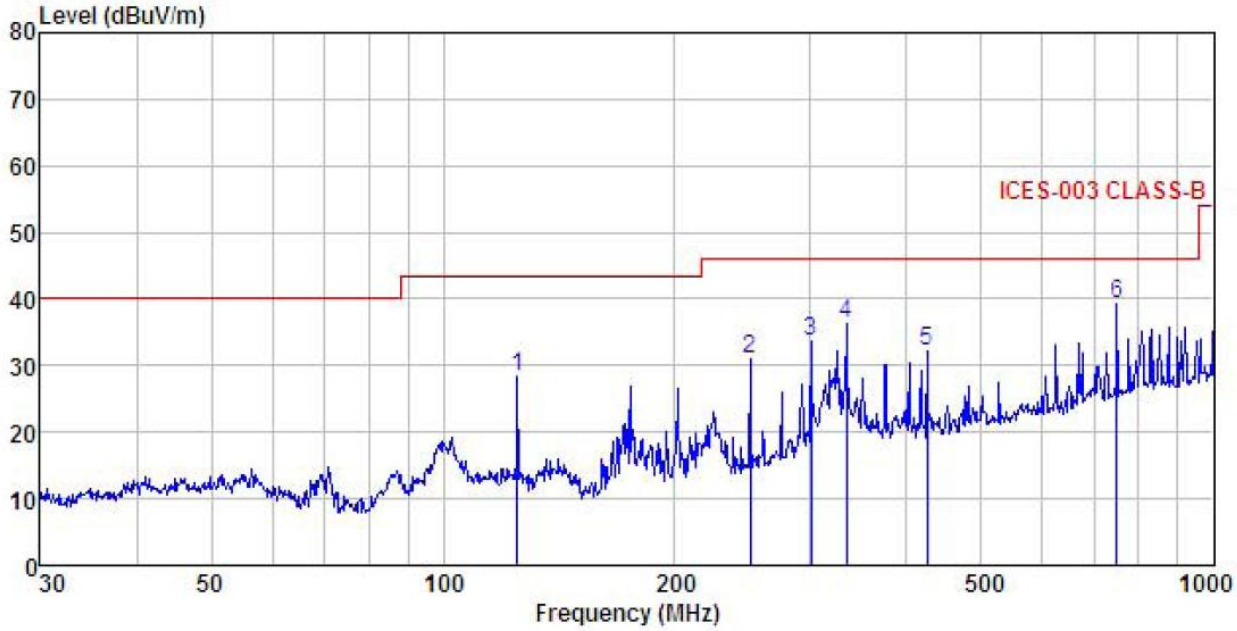


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	100.229	44.28	12.50	1.94	29.53	29.19	43.50	-14.31	QP
2	136.939	46.23	9.69	2.36	29.29	28.99	43.50	-14.51	QP
3	175.037	45.08	9.81	2.69	29.01	28.57	43.50	-14.93	QP
4	333.687	41.79	14.30	3.05	28.52	30.62	46.00	-15.38	QP
5	605.659	38.67	19.53	3.93	28.92	33.21	46.00	-12.79	QP
6	750.108	38.90	20.60	4.36	28.48	35.38	46.00	-10.62	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Product Name:	Media Center HAT	Product Model:	v1.1
Test By:	Carey	Test mode:	On Mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%



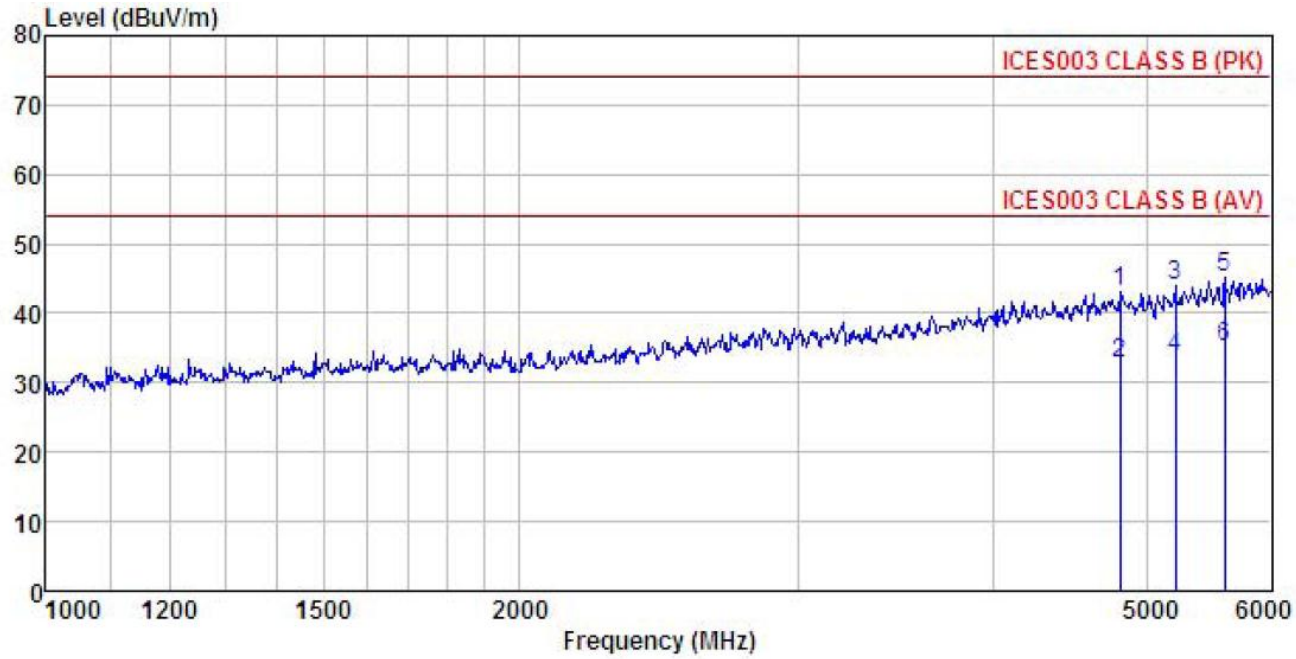
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	125.007	44.93	10.51	2.22	29.36	28.30	43.50	-15.20	QP
2	250.301	44.17	12.70	2.81	28.54	31.14	46.00	-14.86	QP
3	300.367	45.60	13.63	2.94	28.45	33.72	46.00	-12.28	QP
4	333.687	47.35	14.30	3.05	28.52	36.18	46.00	-9.82	QP
5	425.028	41.97	15.90	3.14	28.83	32.18	46.00	-13.82	QP
6	750.108	42.69	20.60	4.36	28.48	39.17	46.00	-6.83	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Above 1GHz:

Product Name:	Media Center HAT	**Product Model:**	v1.1
Test By:	Carey	**Test mode:**	On Mode
Test Frequency:	1 GHz ~ 6 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

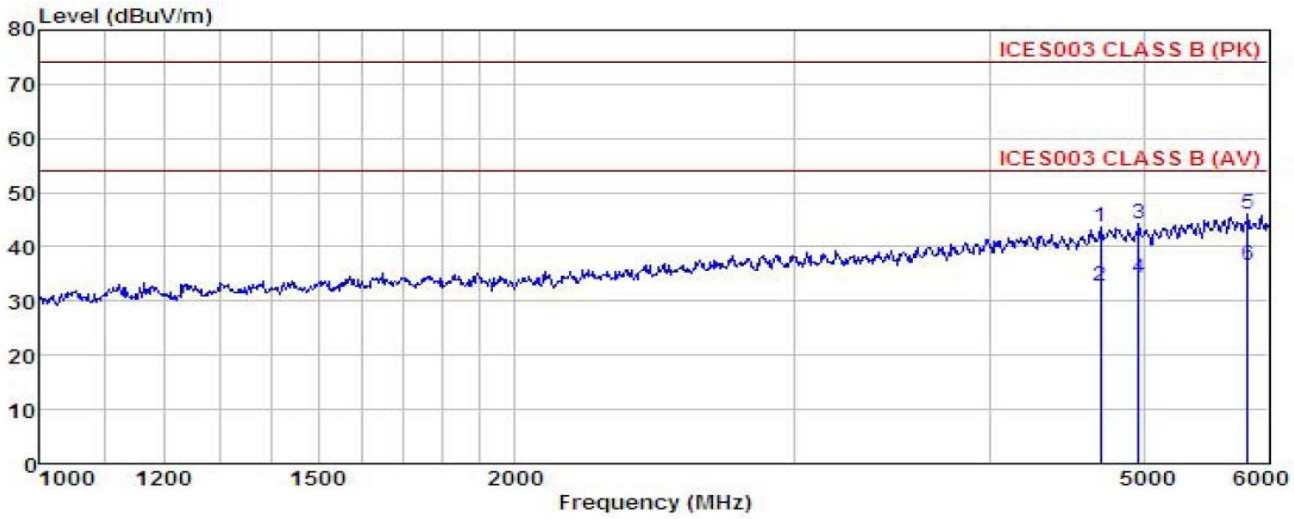


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4813.252	46.93	31.05	6.81	41.82	42.97	74.00	-31.03	Peak
2	4813.252	36.85	31.05	6.81	41.82	32.89	54.00	-21.11	Average
3	5217.416	46.93	31.95	7.09	41.94	44.03	74.00	-29.97	Peak
4	5217.416	36.61	31.95	7.09	41.94	33.71	54.00	-20.29	Average
5	5605.076	46.94	32.62	7.30	41.79	45.07	74.00	-28.93	Peak
6	5605.076	36.87	32.62	7.30	41.79	35.00	54.00	-19.00	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Product Name:	Media Center HAT	Product Model:	v1.1
Test By:	Carey	Test mode:	On Mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4694.016	47.89	30.80	6.85	41.99	43.55	74.00	-30.45	Peak
2	4694.016	37.17	30.80	6.85	41.99	32.83	54.00	-21.17	Average
3	4962.120	47.86	31.33	6.91	41.87	44.23	74.00	-29.77	Peak
4	4962.120	37.81	31.33	6.91	41.87	34.18	54.00	-19.82	Average
5	5819.996	47.57	32.66	7.89	42.02	46.10	74.00	-27.90	Peak
6	5819.996	37.98	32.66	7.89	42.02	36.51	54.00	-17.49	Average

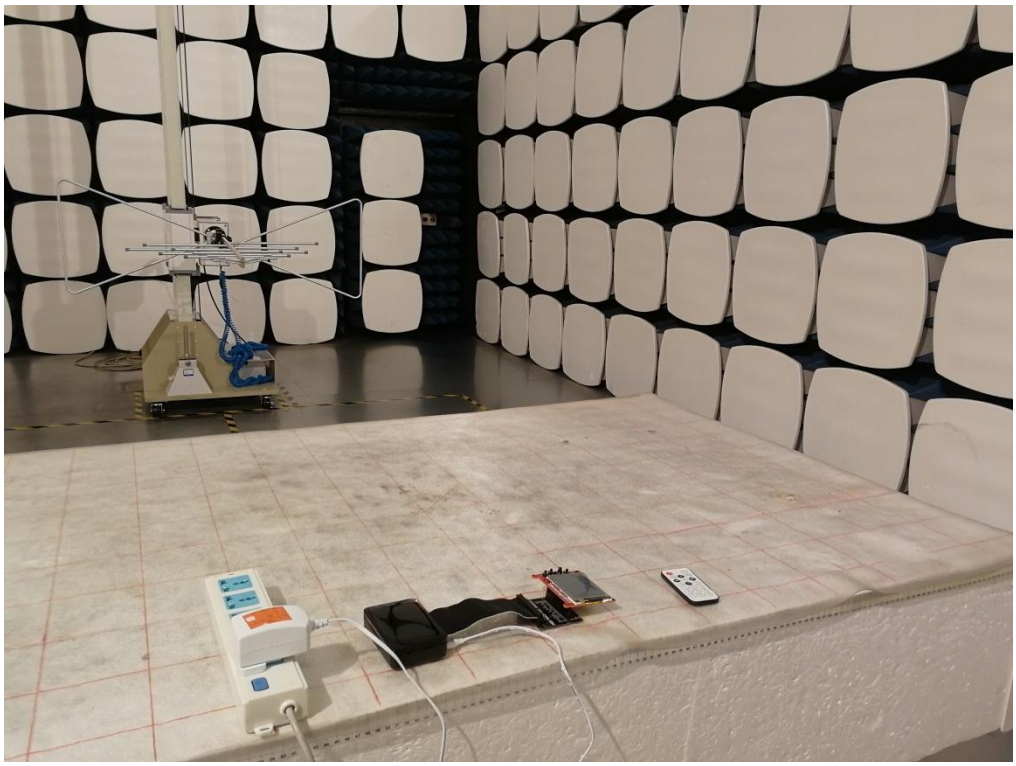
Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

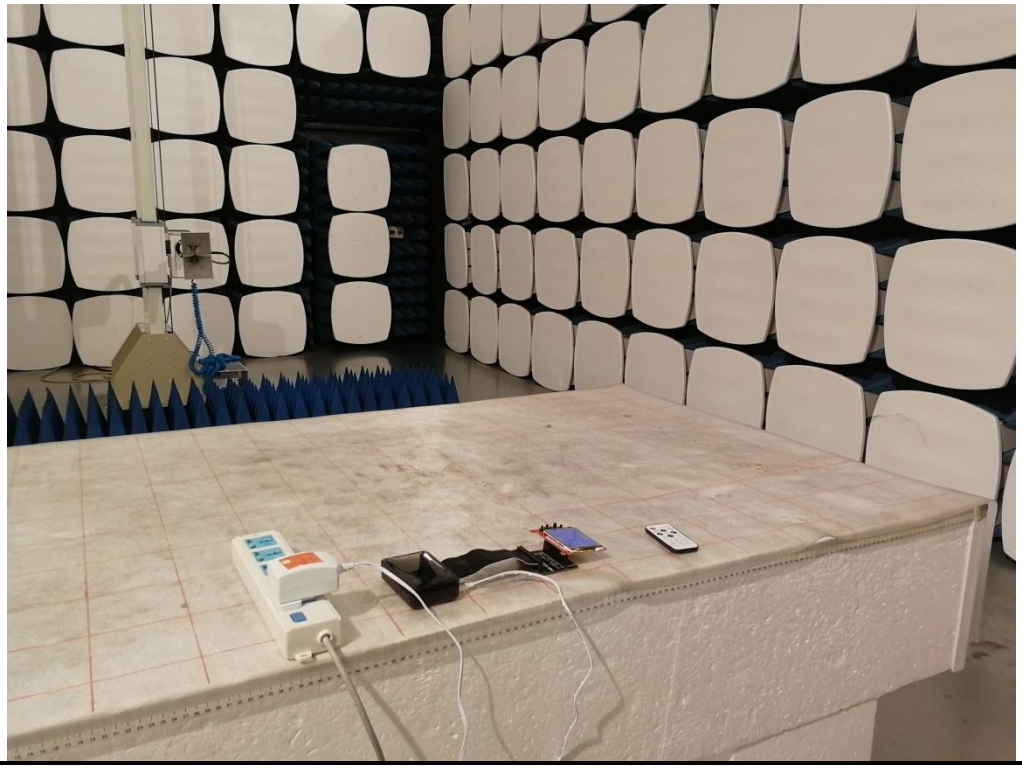
7 Test Setup Photo

Radiated Emission

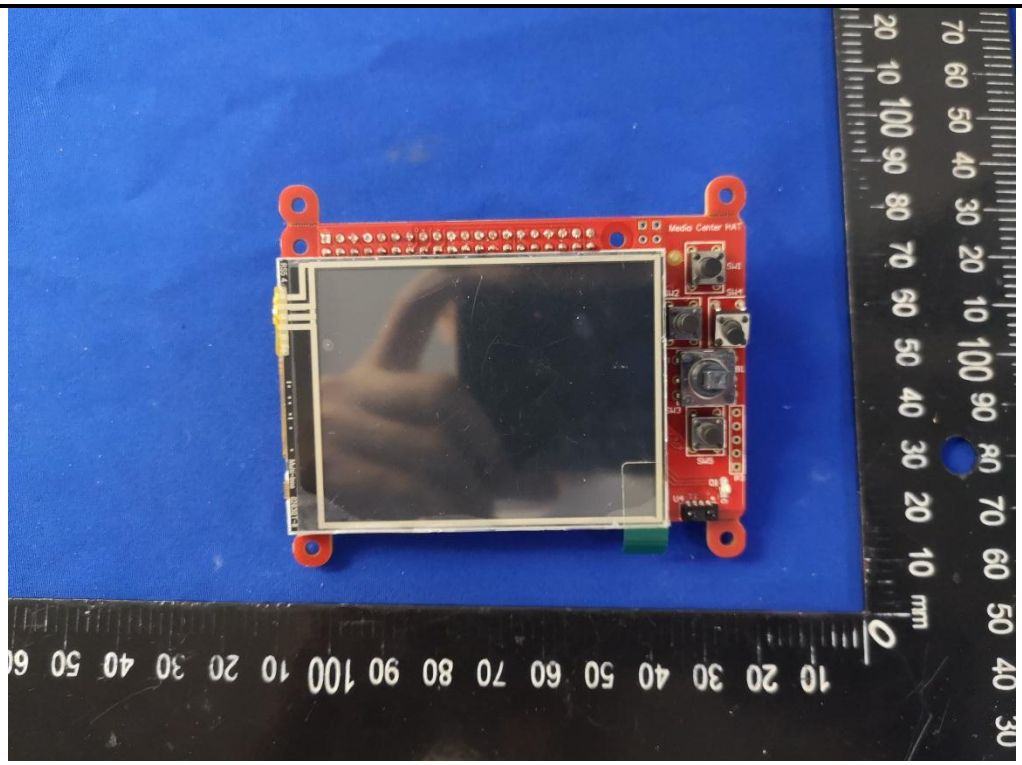
Below 1GHz

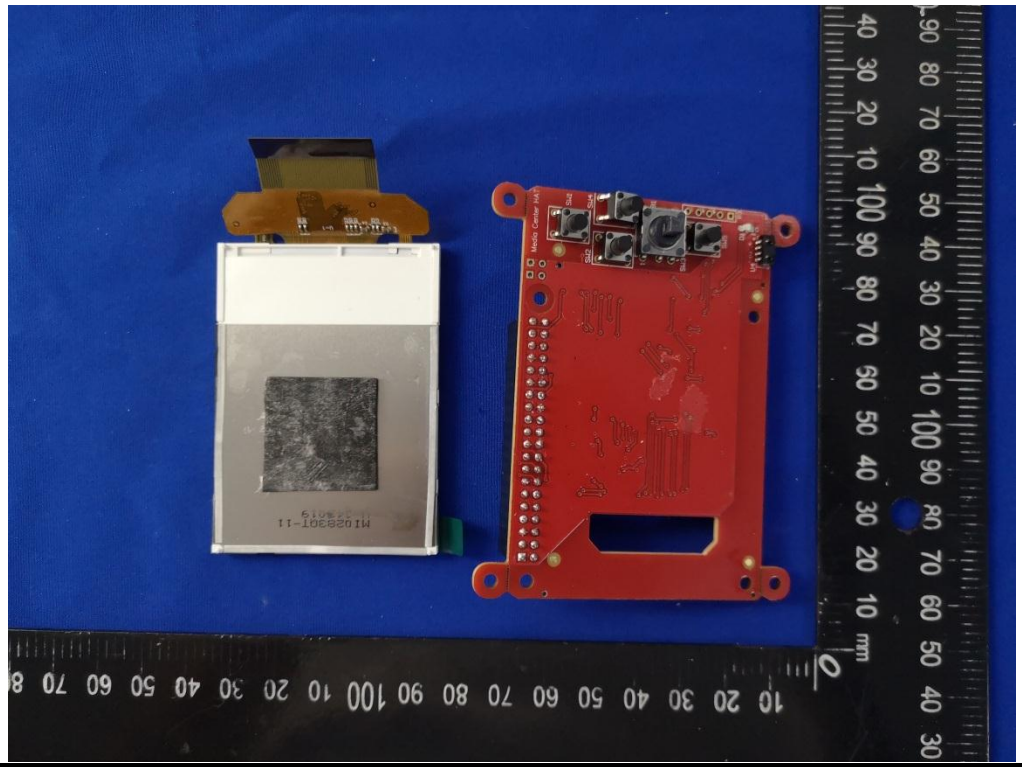


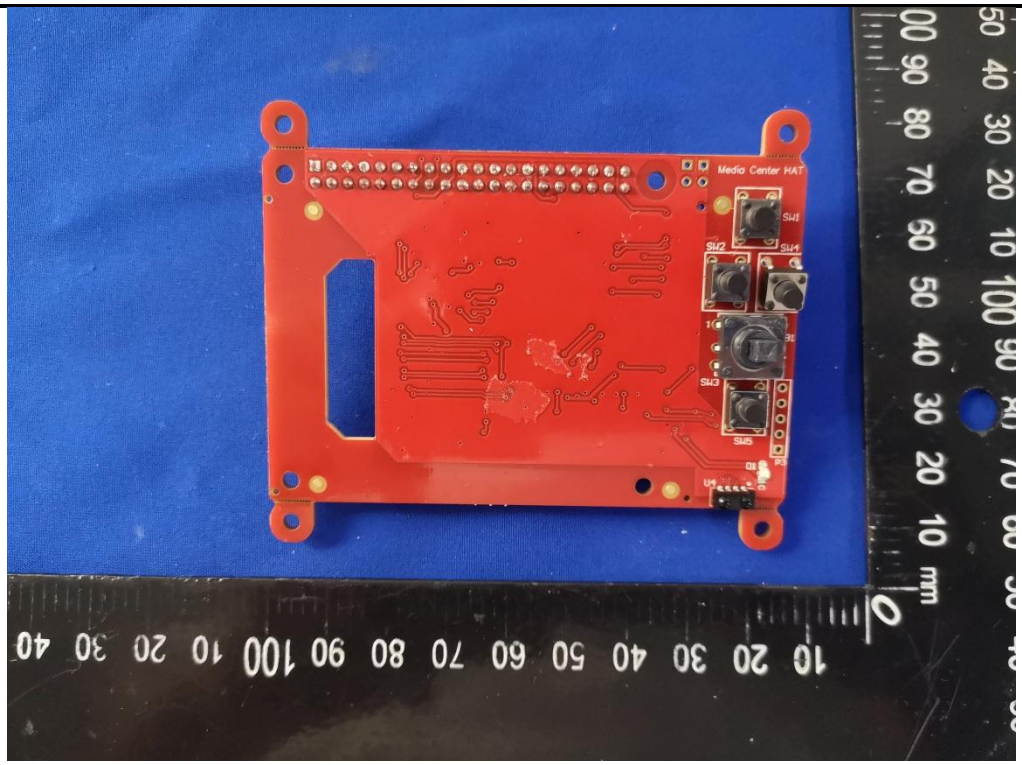
Above 1GHz

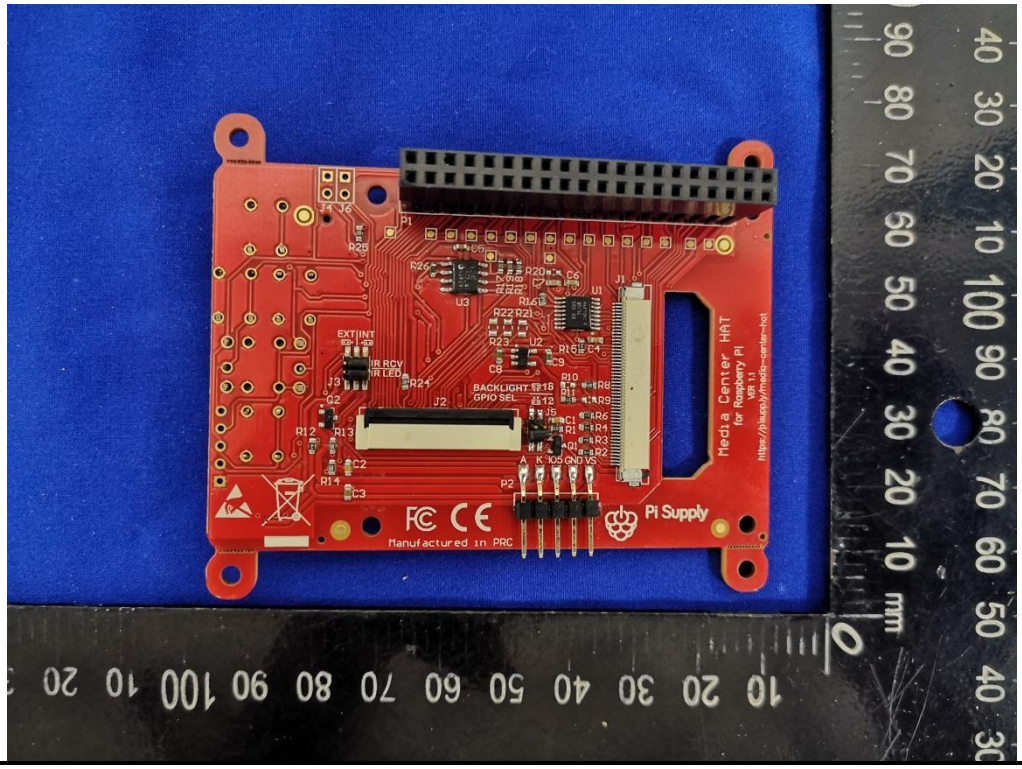


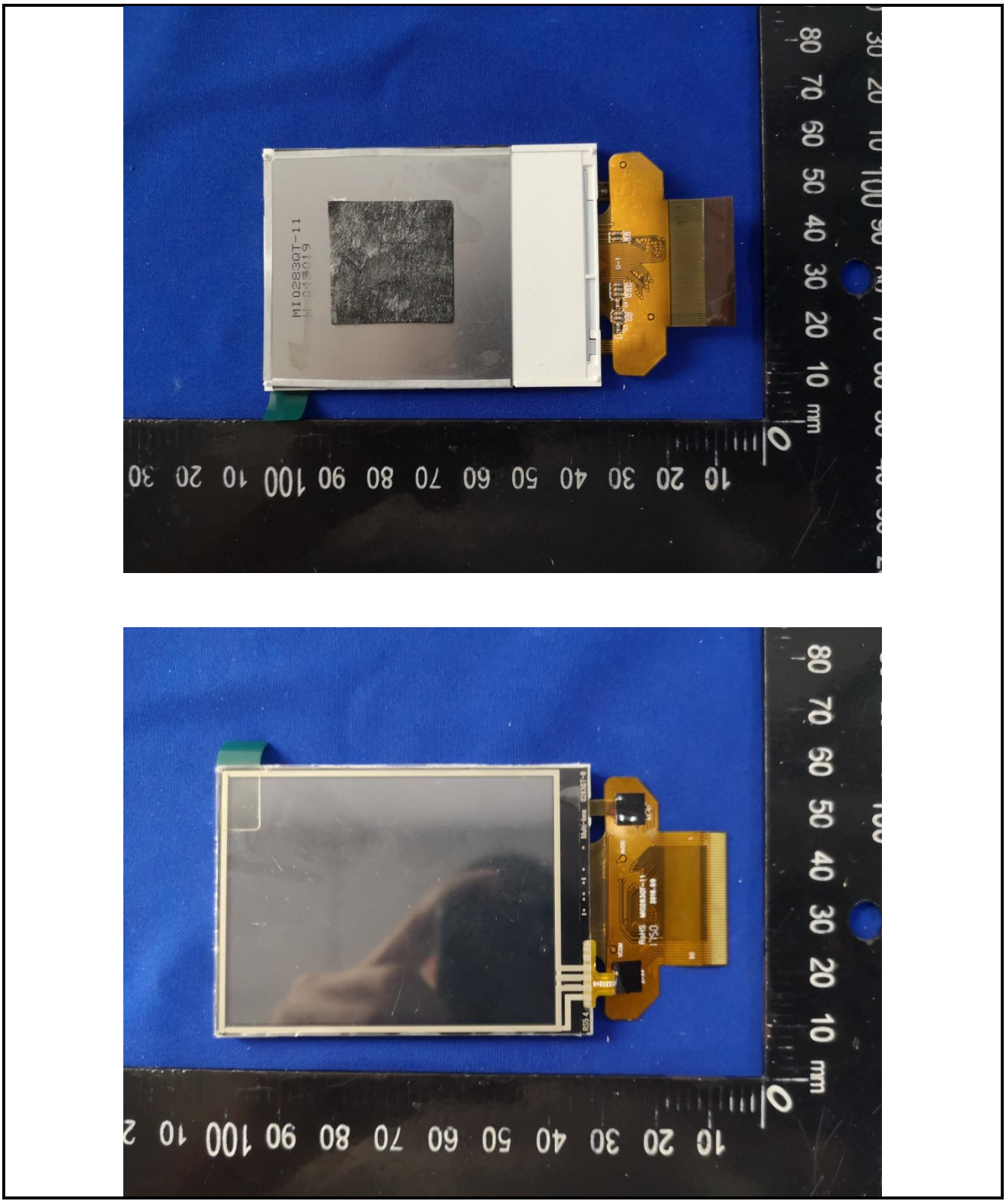
8 EUT Constructional Details

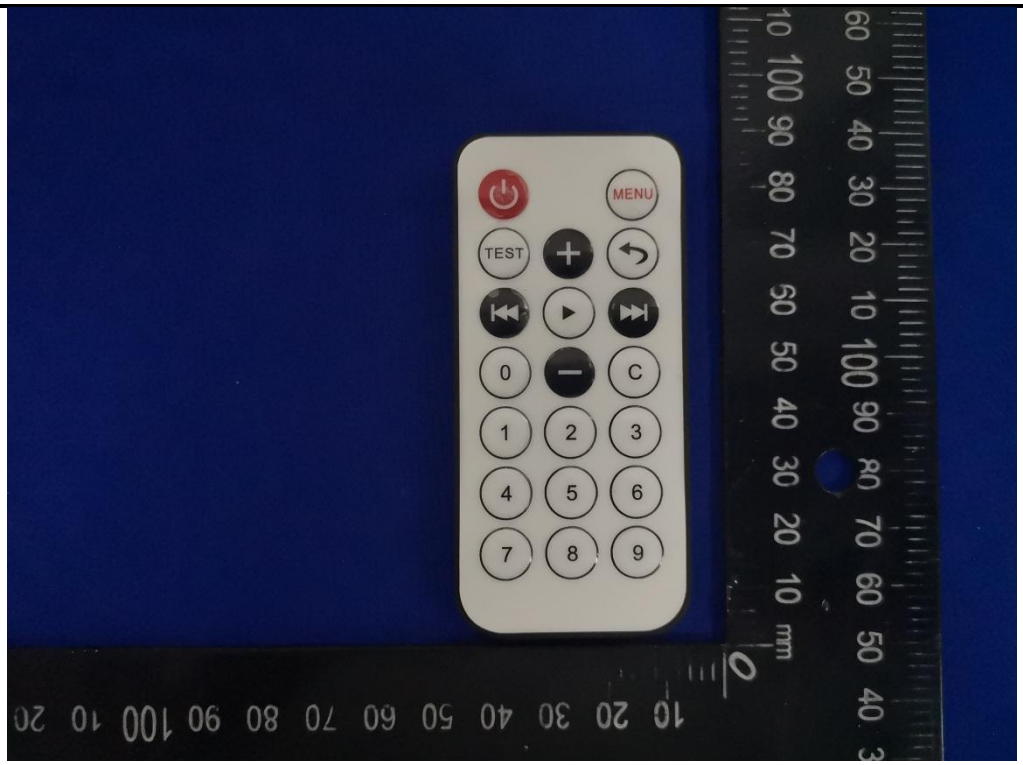





Media Center HAT
SW1
SW2
SW4
SW3
SW5


Media Center HAT
for Raspberry Pi
Pi Supply
Manufactured in PRC
EXT|INT
IR RCV
IR LED
BACKLIGHT
GPIO SEL

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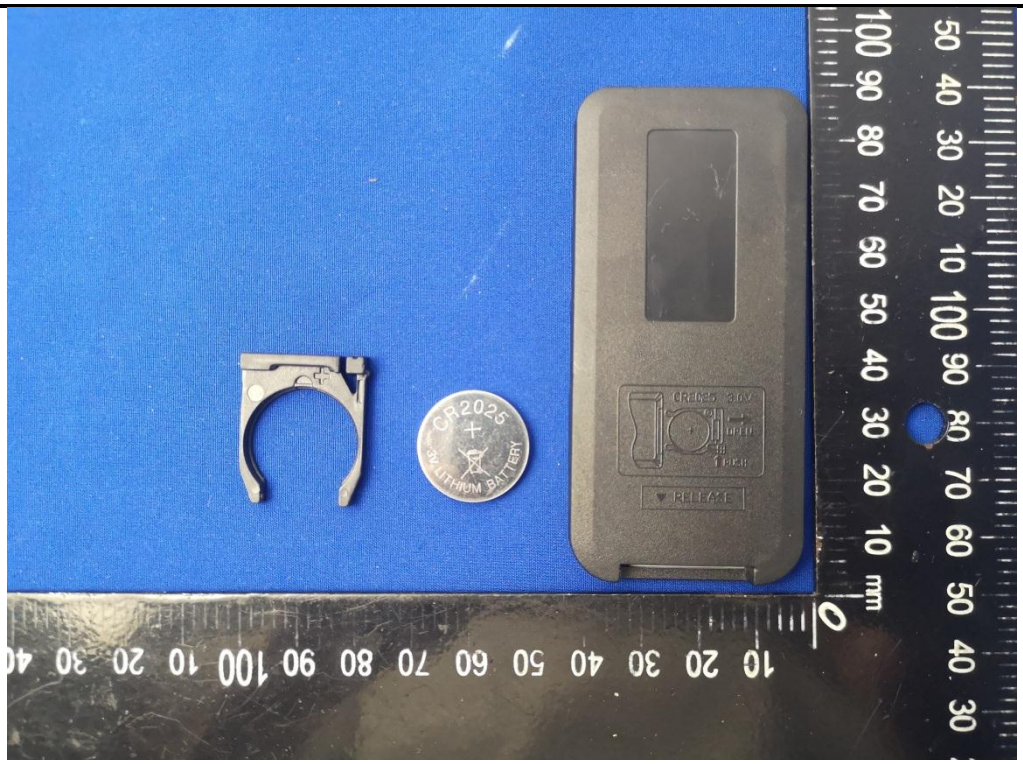
RELEASE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3V LITHIUM BATTERY
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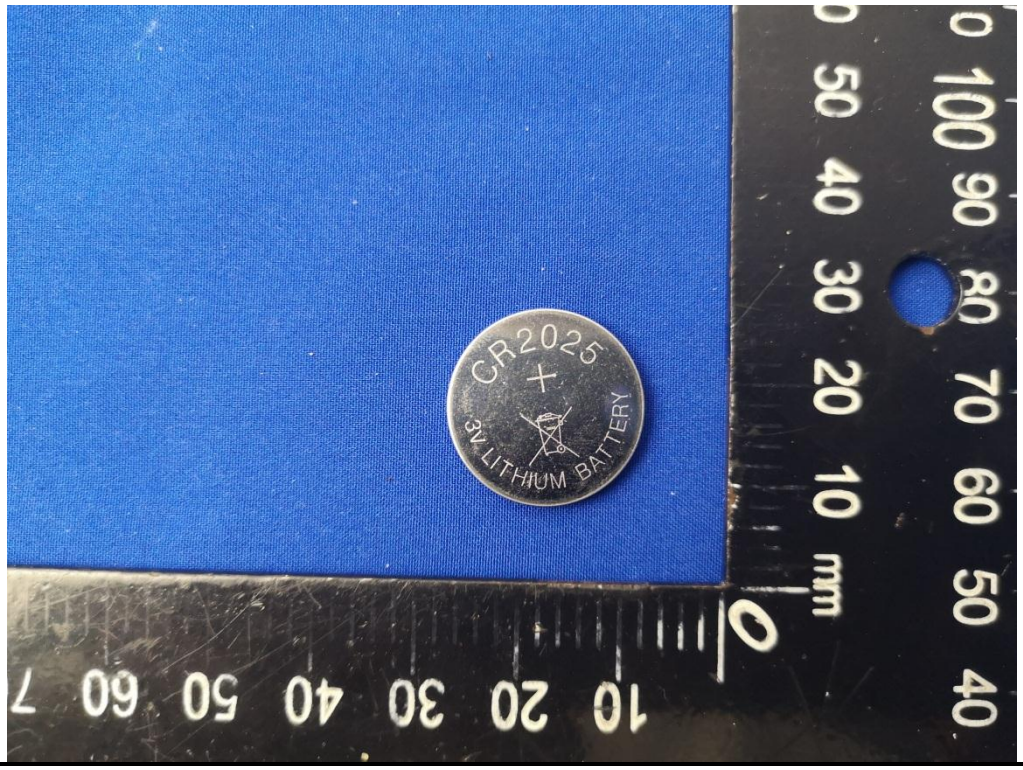
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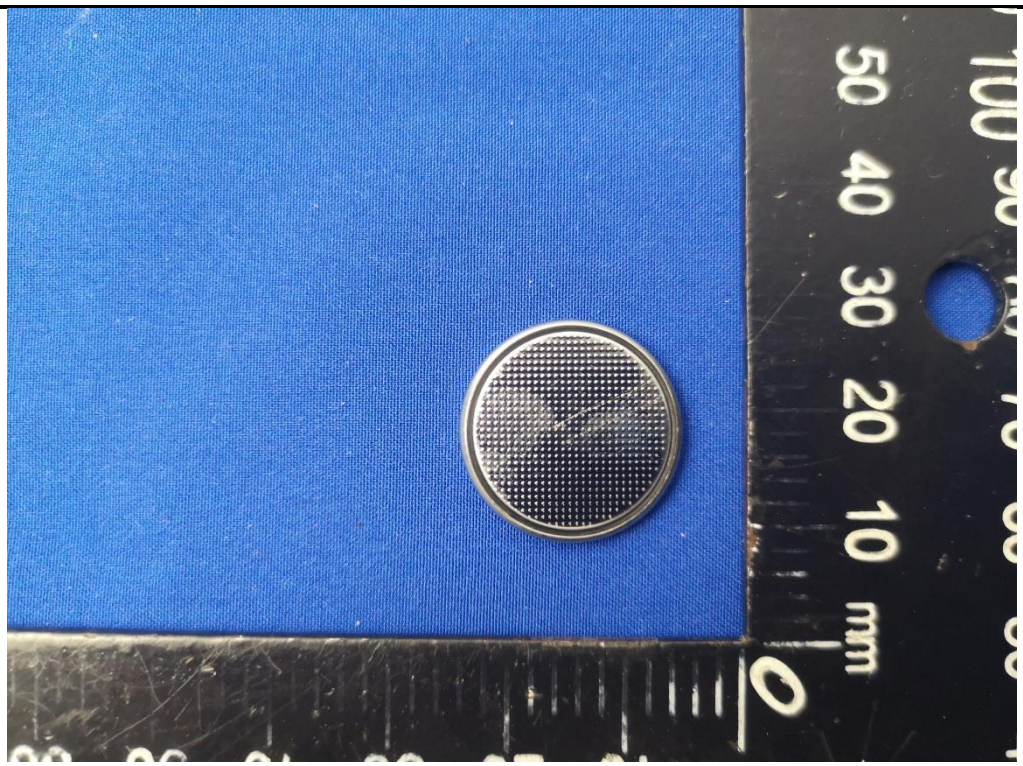

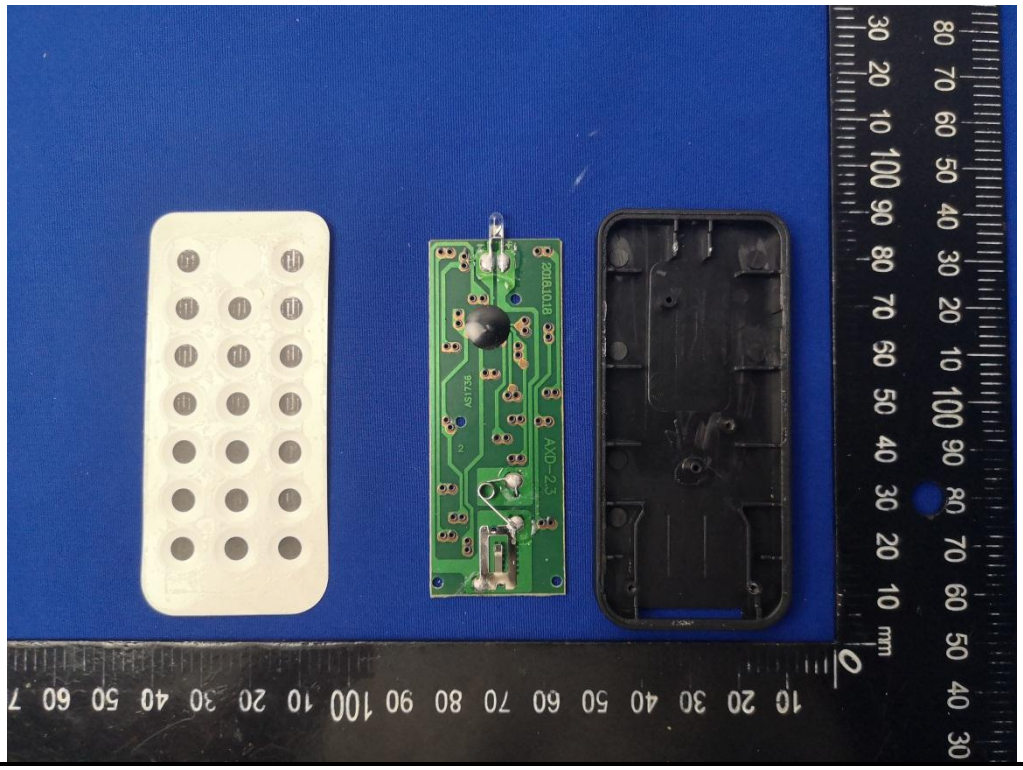

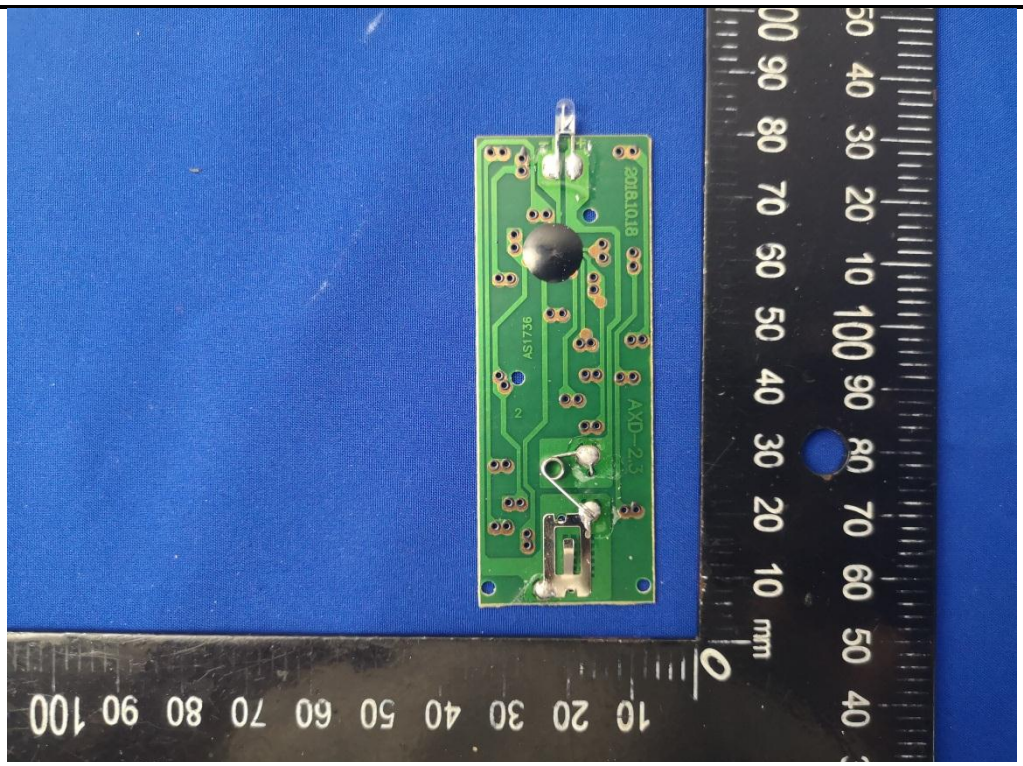

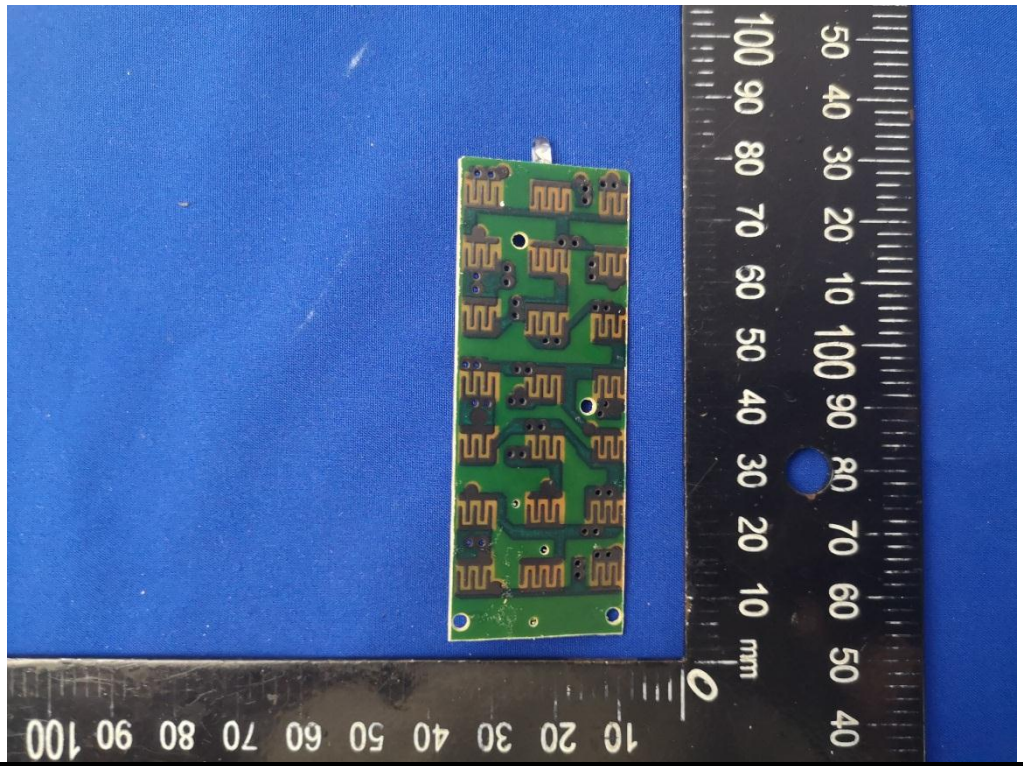

------End of report------