

# FCC REPORT

**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: Pi PoE Switch HAT

Model No.: v2.6

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart B

**Date of sample receipt:** 13 May 2019

**Date of Test:** 14 May to 20 Jul., 2019

**Date of report issued:** 21 Jul., 2019

**Test Result:** PASS \*

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

Authorized Signature:



Bruce Zhang  
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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## 2 Version

Version No.	Date	Description
00	21 Jul., 2019	Original

Tested by:

*Mike.ou*

Date:

21 Jul., 2019

**Test Engineer**

Reviewed by:

*Winner Zhang*

Date:

21 Jul., 2019

**Project Engineer**

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## 4 Test Summary

Test Item	Section in CFR 47	Result
Conducted Emission	Part 15.107	N/A
Radiated Emission	Part 15.109	Pass
<i>Remark:</i> <i>Pass: The EUT complies with the essential requirements in the standard.</i> <i>N/A: The EUT not applicable of the test item.</i>		

## 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:	Pi PoE Switch HAT
Model No.:	v2.6
Power supply:	DC 48V
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
<p>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 &amp; 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.</p>	

### 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)	±4.54 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.84 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.36 dB (k=2)

### 5.5 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
Nebra	Raspberry Pi	V1.2	N/A	N/A
RS Components	Adapter	DSA-13PFC-05	N/A	N/A
TP-Link	PoE Injector	TL-POE150S	N/A	N/A

## 5.6 Related Submittal(s) / Grant (s)

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

## 5.7 Description of Cable Used

Cable Type	Description	Length	From	To
N/A	N/A	N/A	N/A	N/A

## 5.8 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>

## 5.9 Laboratory Location

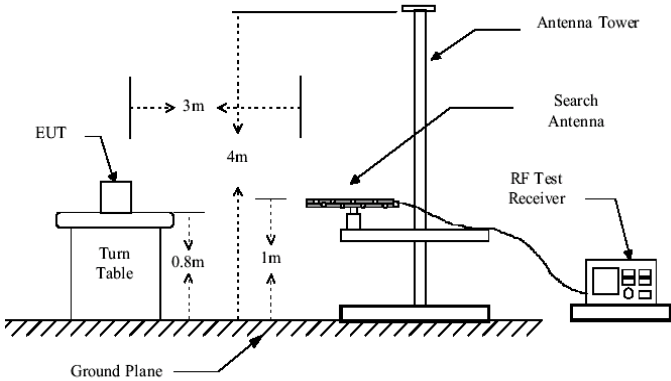
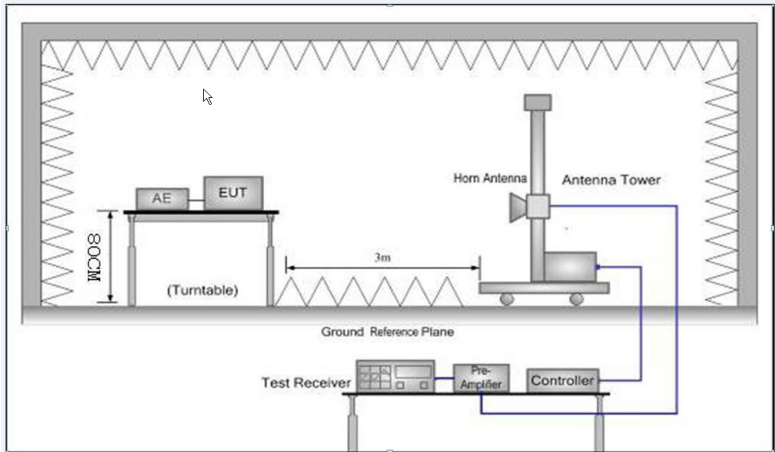
Shenzhen Zhongjian Nanfang Testing Co., Ltd.  
Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,  
Bao'an District, Shenzhen, Guangdong, China  
Tel: +86-755-23118282, Fax: +86-755-23116366  
Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

## 5.10 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

Test Requirement:	FCC Part 15 B Section 15.109				
Test Method:	ANSI C63.4:2014				
Test Frequency Range:	30MHz to 6000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak RMS	1MHz 1MHz	3MHz 3MHz	Peak Value Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.0		Quasi-peak Value
	88MHz-216MHz		43.5		Quasi-peak Value
	216MHz-960MHz		46.0		Quasi-peak Value
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.0 74.0		Average Value Peak Value
Test setup:	Below 1GHz				
					
Test setup:	Above 1GHz				
					

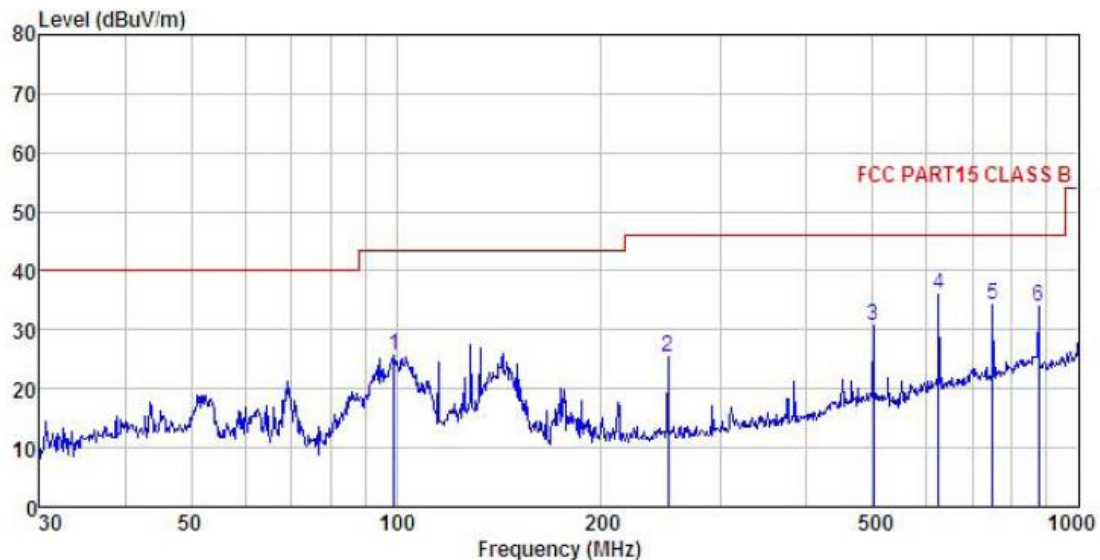
Test Procedure:	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>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.</li> <li>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.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>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.</li> </ol>
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	All of the observed value above 6GHz were the noise floor, which were not recorded



## Measurement Data:

Below 1GHz:

Product Name:	Pi PoE Switch HAT	Product Model:	v2.6
Test By:	Mike	Test mode:	On mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Humi: 57%

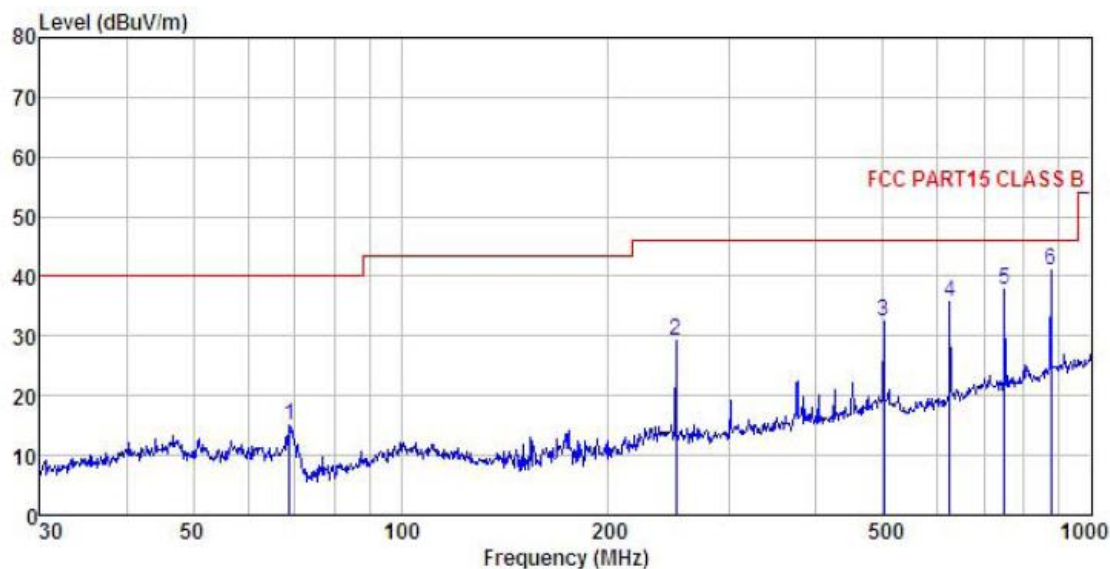


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	99.180	40.93	12.32	1.95	29.53	25.67	43.50	-17.83	QP
2	250.301	38.55	12.70	2.81	28.54	25.52	46.00	-20.48	QP
3	501.179	37.89	18.20	3.63	28.96	30.76	46.00	-15.24	QP
4	625.078	41.31	19.61	3.90	28.86	35.96	46.00	-10.04	QP
5	750.108	37.85	20.60	4.36	28.48	34.33	46.00	-11.67	QP
6	875.247	35.25	22.55	3.95	27.94	33.81	46.00	-12.19	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:	Pi PoE Switch HAT	Product Model:	v2.6
Test By:	Mike	Test mode:	On mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Humi: 57%



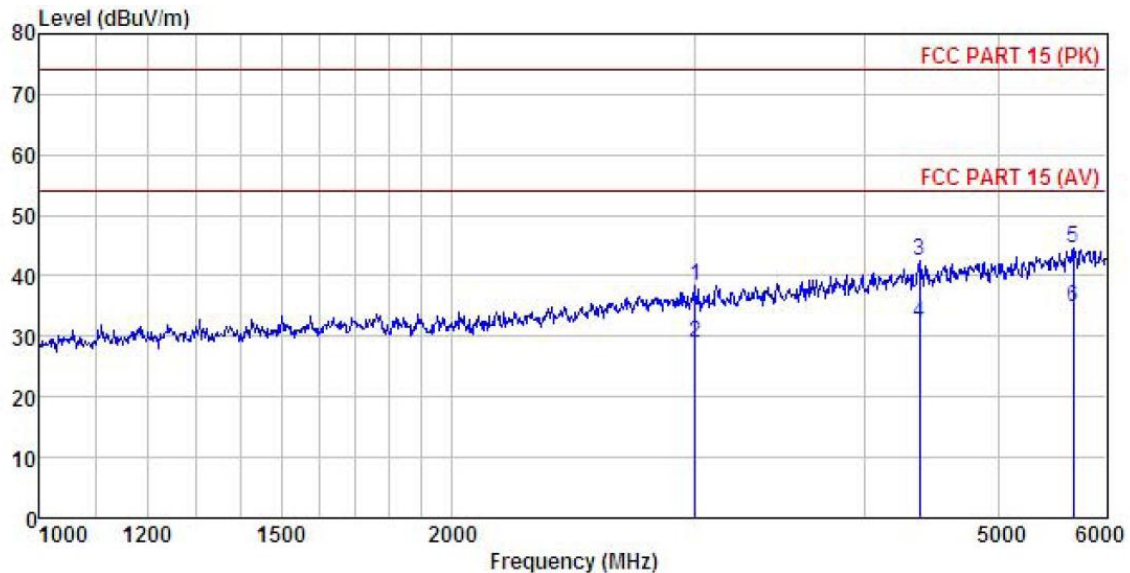
	ReadAntenna	Cable Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level
MHz	dBuV	dB/m	dB	dB	dBuV/m
1	68.872	34.52	8.74	1.49	29.73
2	250.301	42.26	12.70	2.81	28.54
3	501.179	39.59	18.20	3.63	28.96
4	625.078	41.04	19.61	3.90	28.86
5	750.108	41.16	20.60	4.36	28.48
6	875.247	42.46	22.55	3.95	27.94

## 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:**

<b>Product Name:</b>	Pi PoE Switch HAT	<b>Product Model:</b>	v2.6
<b>Test By:</b>	Mike	<b>Test mode:</b>	On mode
<b>Test Frequency:</b>	1 GHz ~ 6 GHz	<b>Polarization:</b>	Vertical
<b>Test Voltage:</b>	AC 120/60Hz	<b>Environment:</b>	Temp: 24℃ Humi: 57%

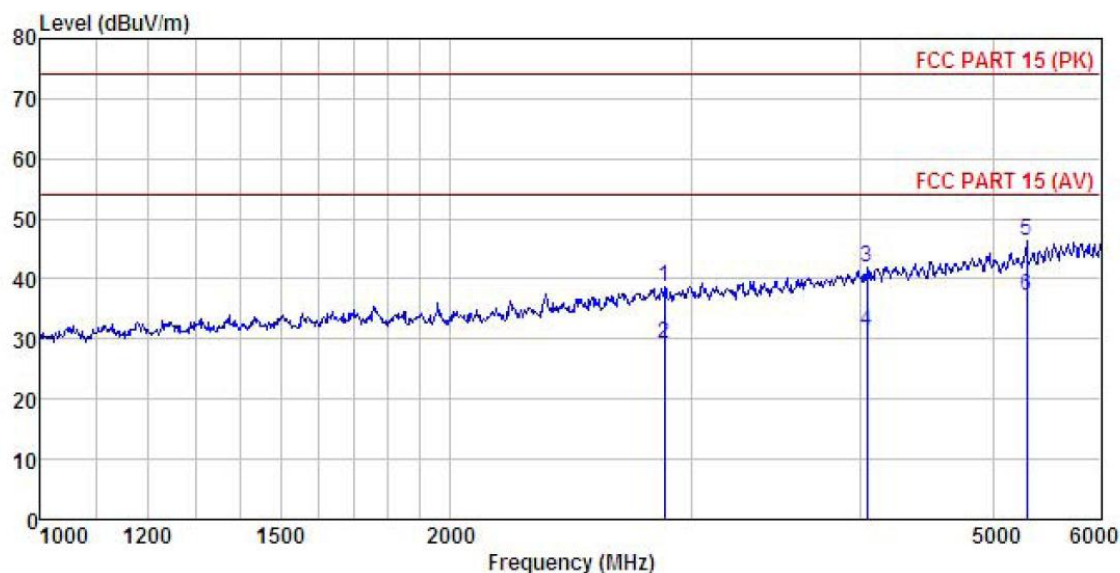


	Freq	ReadAntenna	Cable	Preamp	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Level	Line
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	3004.588	45.96	28.50	5.35	41.51	38.30	74.00
2	3004.588	36.51	28.50	5.35	41.51	28.85	54.00
3	4385.052	47.30	30.38	6.67	41.95	42.40	74.00
4	4385.052	37.10	30.38	6.67	41.95	32.20	54.00
5	5675.819	46.14	32.64	7.55	41.89	44.44	74.00
6	5675.819	36.45	32.64	7.55	41.89	34.75	54.00

**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:	Pi PoE Switch HAT	Product Model:	v2.6
Test By:	Mike	Test mode:	On mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Humi: 57%



	Freq	ReadAntenna	Cable Preamp	Level	Limit	Over	Remark
	MHz	Level	Factor	Loss Factor	Level	Line	Limit
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	2867.827	46.83	28.24	5.21	41.60	38.68	74.00
2	2867.827	37.49	28.24	5.21	41.60	29.34	54.00
3	4038.126	47.31	30.31	6.16	41.81	41.97	74.00
4	4038.126	36.66	30.31	6.16	41.81	31.32	54.00
5	5292.741	49.02	32.13	7.10	41.91	46.34	74.00
6	5292.741	39.89	32.13	7.10	41.91	37.21	54.00

**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.

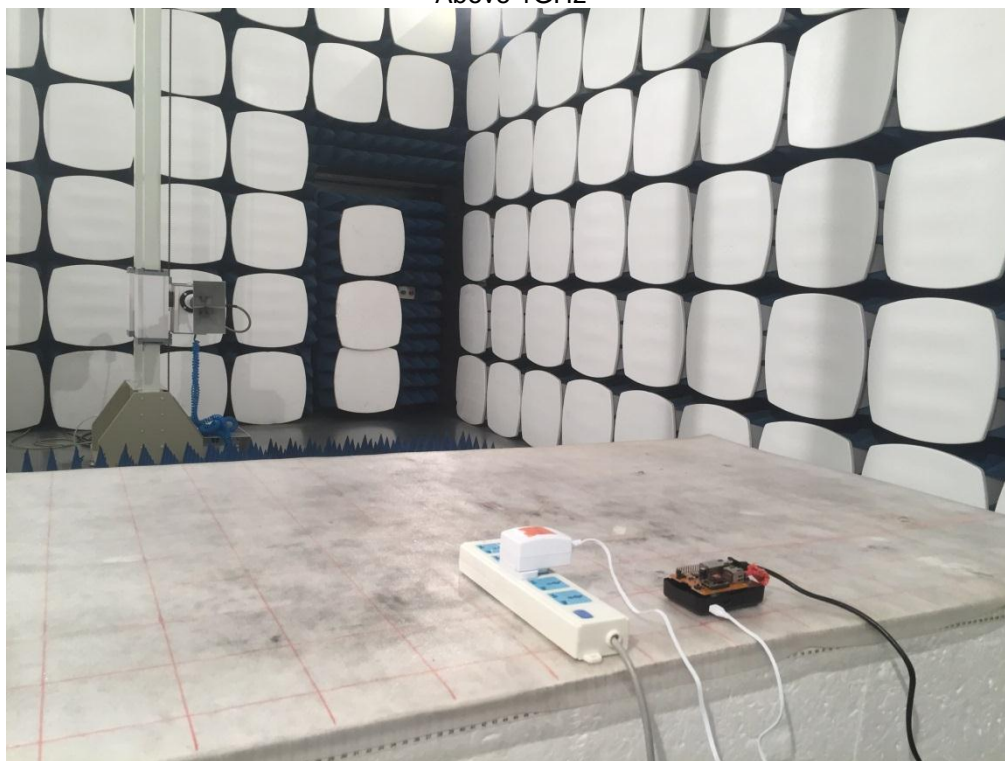


## 7 Test Setup Photo

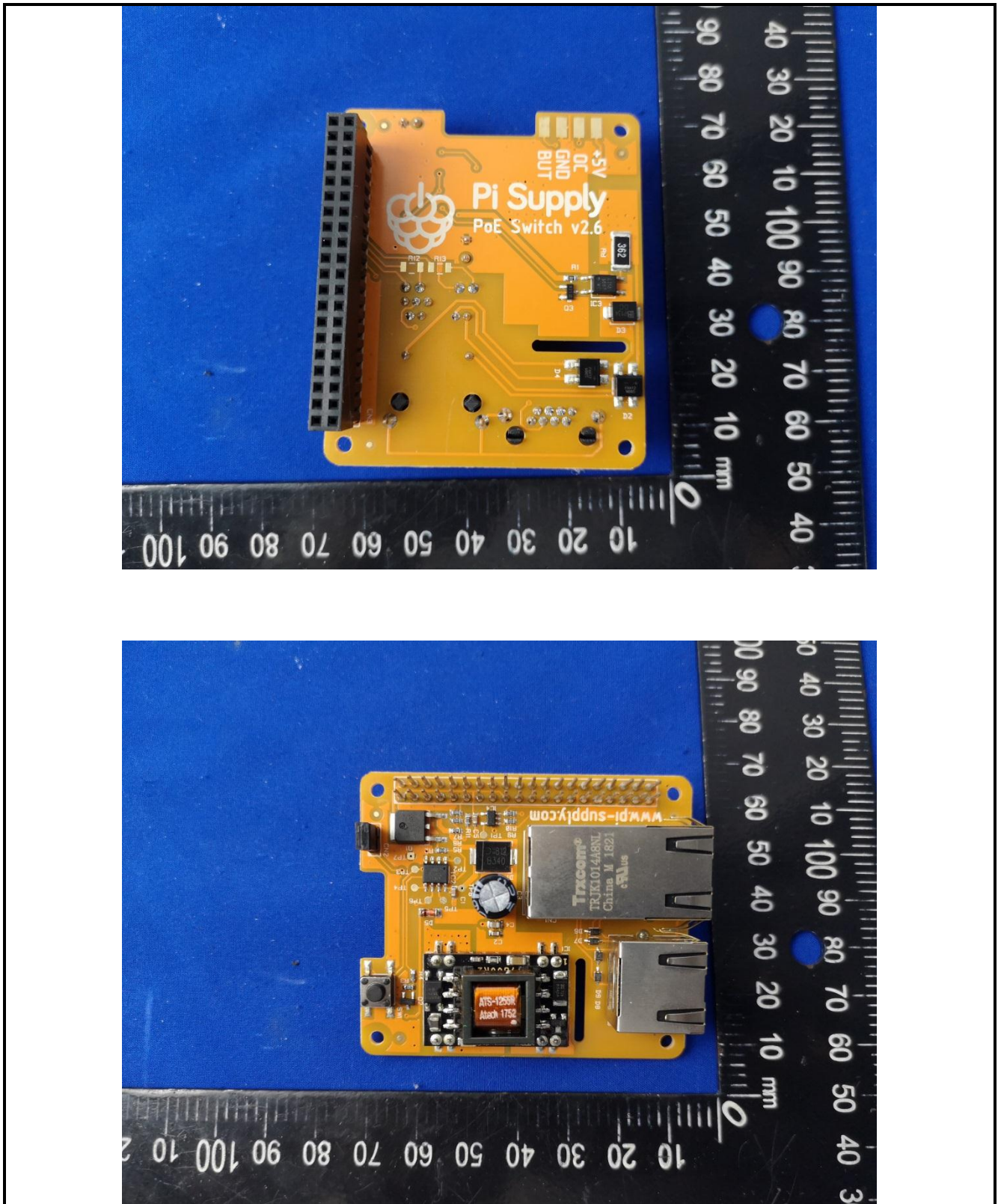
Radiated Emission  
Below 1GHz



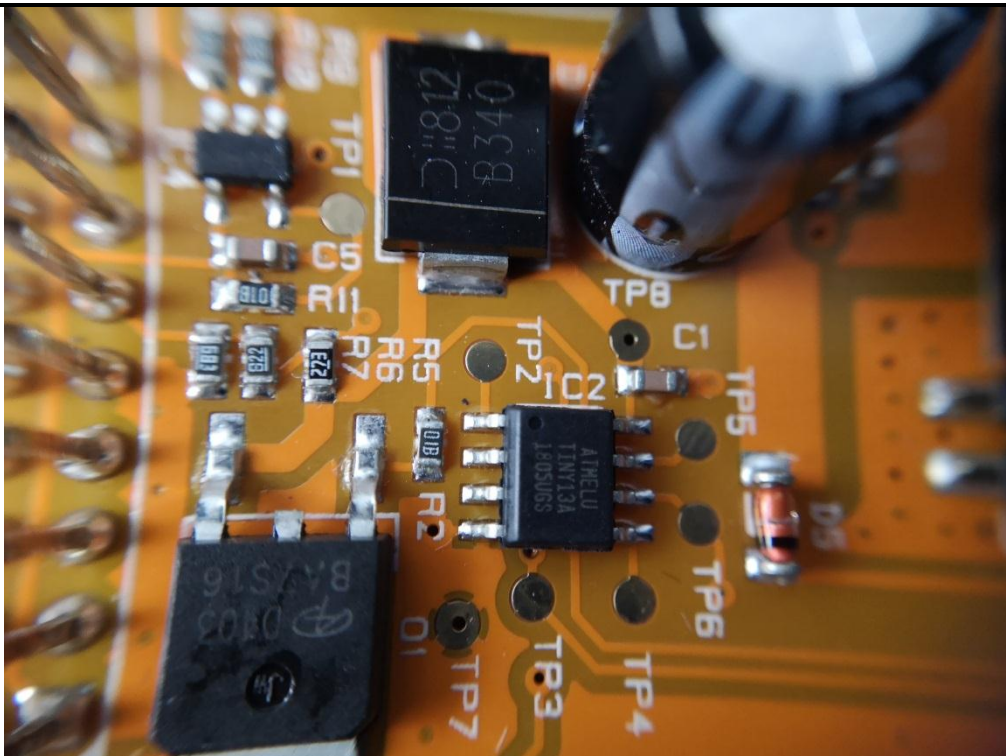
Above 1GHz

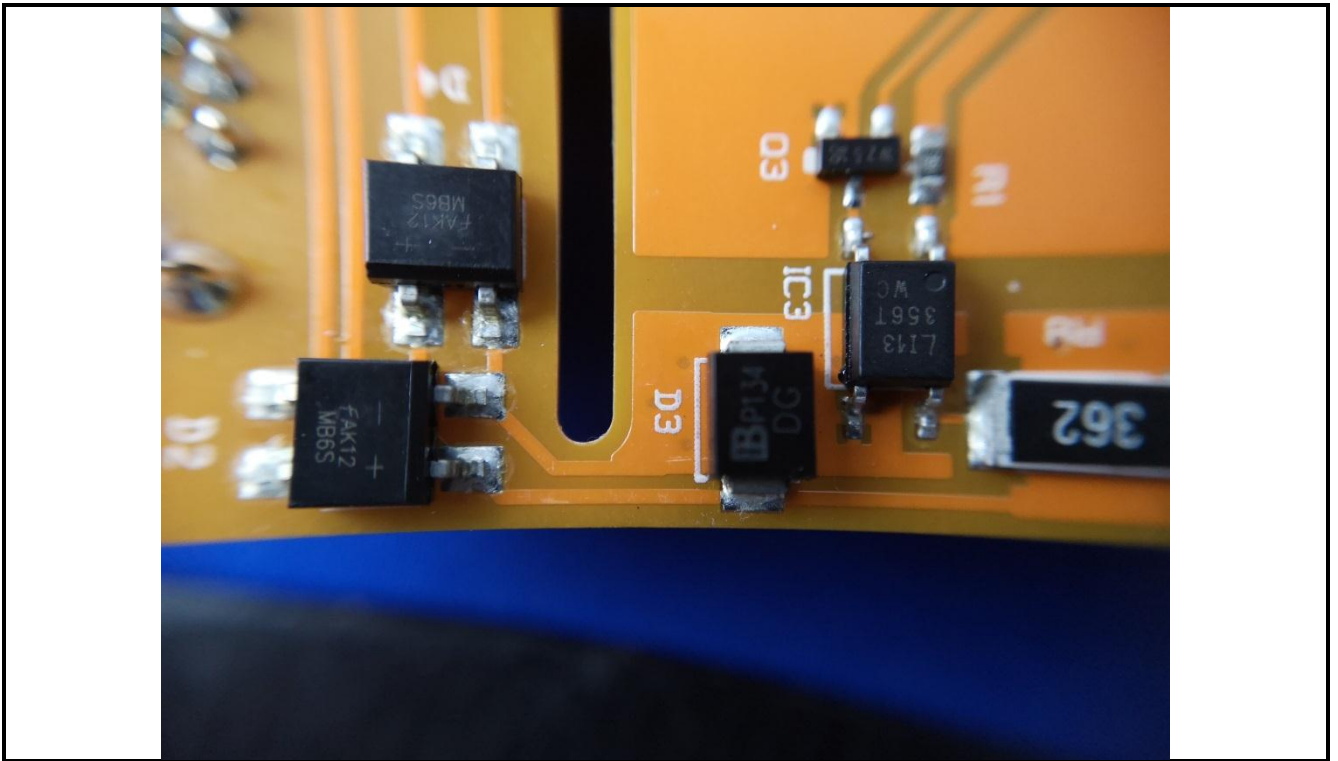


## 8 EUT Constructional Details









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