IC 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:	ICES-003 Issue 6 Published: January 2016, Updated: April 2017
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

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		Result
	FCC	IC	
Conducted Emission	Part 15.107	ICES-003 Section 6.1	N/A
Radiated Emission	Part 15.109	ICES-003 Section 6.2	Pass

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

N/A: The EUT not applicable of the test item.

5 General Information

5.1 Client Information

Applicant:	Nebra Ltd
Address of Applicant:	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
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)	±2.22 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±2.76 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±2.88 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

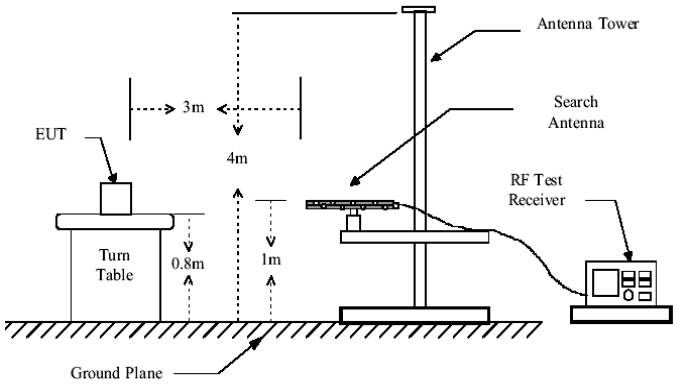
Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

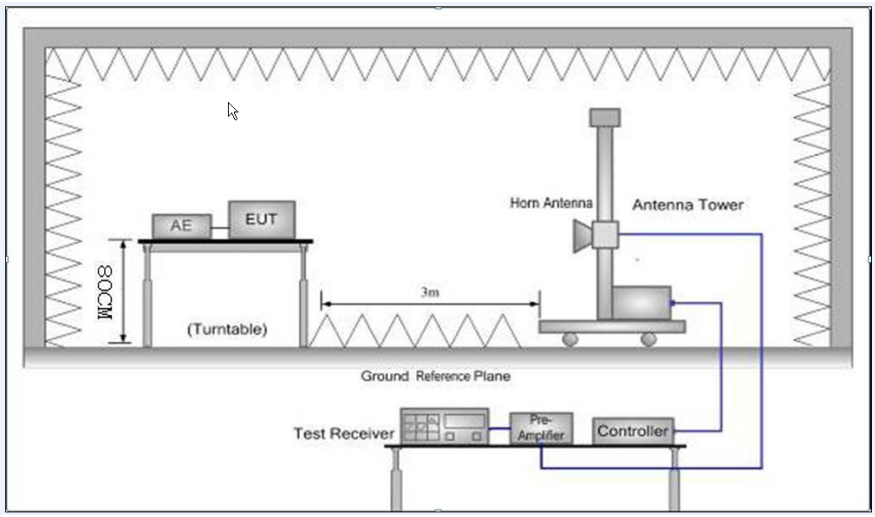
5.10 Test Instruments list

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

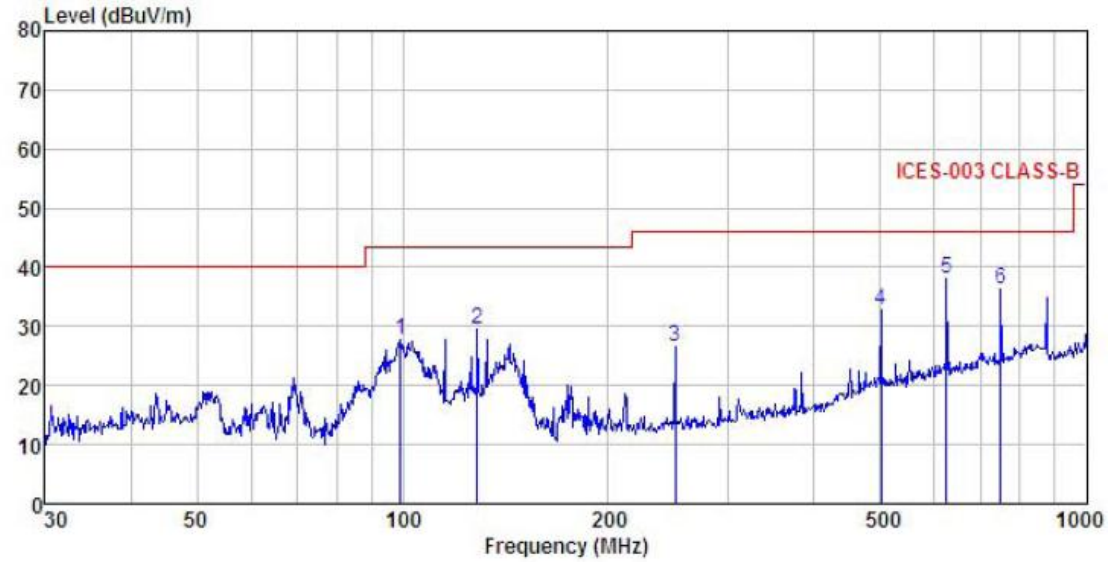
<table>
<tr><td>Test Requirement:</td><td colspan="5">ICES-003 Section 6.2</td></tr>
<tr><td>Test Method:</td><td colspan="5">ANSI C63.4:2014</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="5">30MHz to 6000MHz</td></tr>
<tr><td>Test site:</td><td colspan="5">Measurement Distance: 3m (Semi-Anechoic 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>
</table>

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 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	All of the observed value above 6GHz ware the niose floor, which were no recorded

Measurement Data:

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℃ Huni: 57%

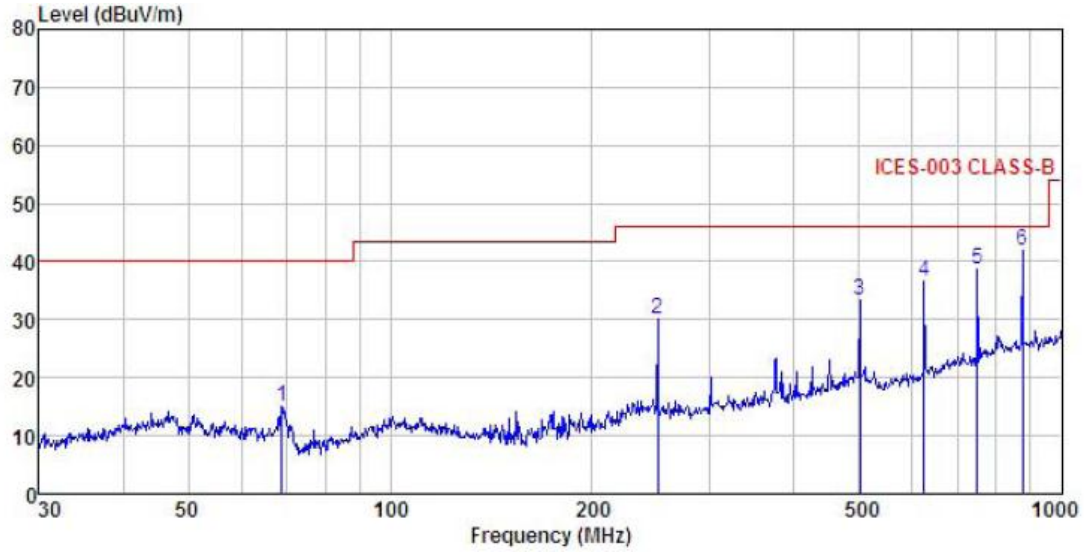


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	99.180	42.93	12.32	1.95	29.53	27.67	43.50	-15.83	QP
2	128.563	46.34	10.25	2.27	29.34	29.52	43.50	-13.98	QP
3	250.301	39.55	12.70	2.81	28.54	26.52	46.00	-19.48	QP
4	501.179	39.89	18.20	3.63	28.96	32.76	46.00	-13.24	QP
5	625.078	43.31	19.61	3.90	28.86	37.96	46.00	-8.04	QP
6	750.108	39.85	20.60	4.36	28.48	36.33	46.00	-9.67	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℃ Huni: 57%



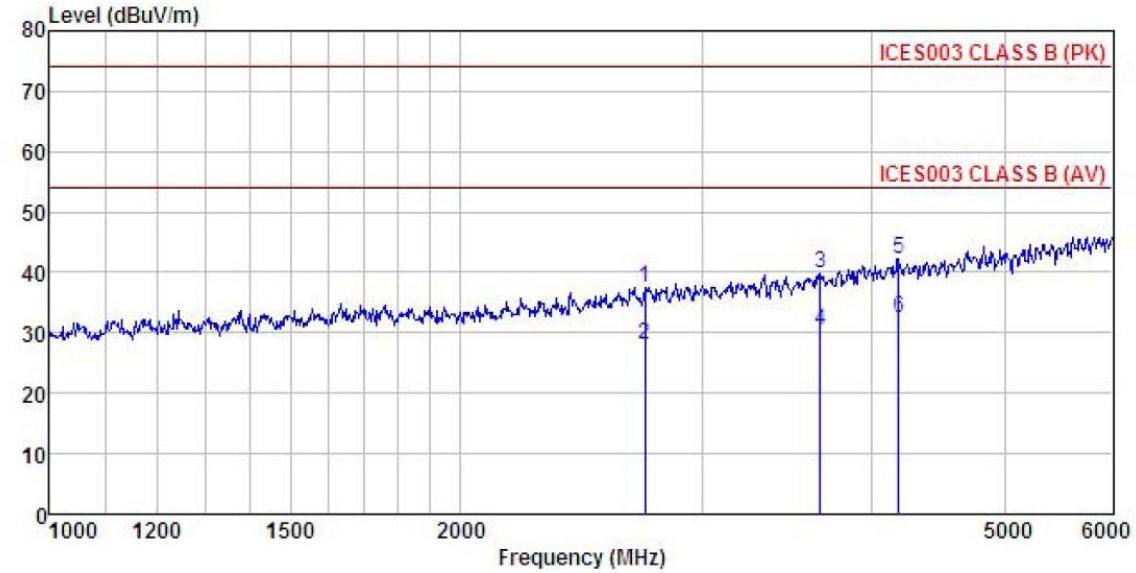
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	68.872	34.52	8.74	1.49	29.73	15.02	40.00	-24.98	QP
2	250.301	43.26	12.70	2.81	28.54	30.23	46.00	-15.77	QP
3	501.179	40.59	18.20	3.63	28.96	33.46	46.00	-12.54	QP
4	625.078	42.04	19.61	3.90	28.86	36.69	46.00	-9.31	QP
5	750.108	42.16	20.60	4.36	28.48	38.64	46.00	-7.36	QP
6	875.247	43.46	22.55	3.95	27.94	42.02	46.00	-3.98	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:	Pi PoE Switch HAT	**Product Model:**	v2.6
Test By:	Mike	**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	2727.500	46.32	27.92	5.07	41.74	37.57	74.00	-36.43	Peak
2	2727.500	36.89	27.92	5.07	41.74	28.14	54.00	-25.86	Average
3	3665.723	46.36	29.18	5.95	41.62	39.87	74.00	-34.13	Peak
4	3665.723	36.78	29.18	5.95	41.62	30.29	54.00	-23.71	Average
5	4185.457	47.34	30.34	6.37	41.81	42.24	74.00	-31.76	Peak
6	4185.457	37.48	30.34	6.37	41.81	32.38	54.00	-21.62	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:	Pi PoE Switch HAT	Product Model:	v2.6
Test By:	Mike	Test mode:	On mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
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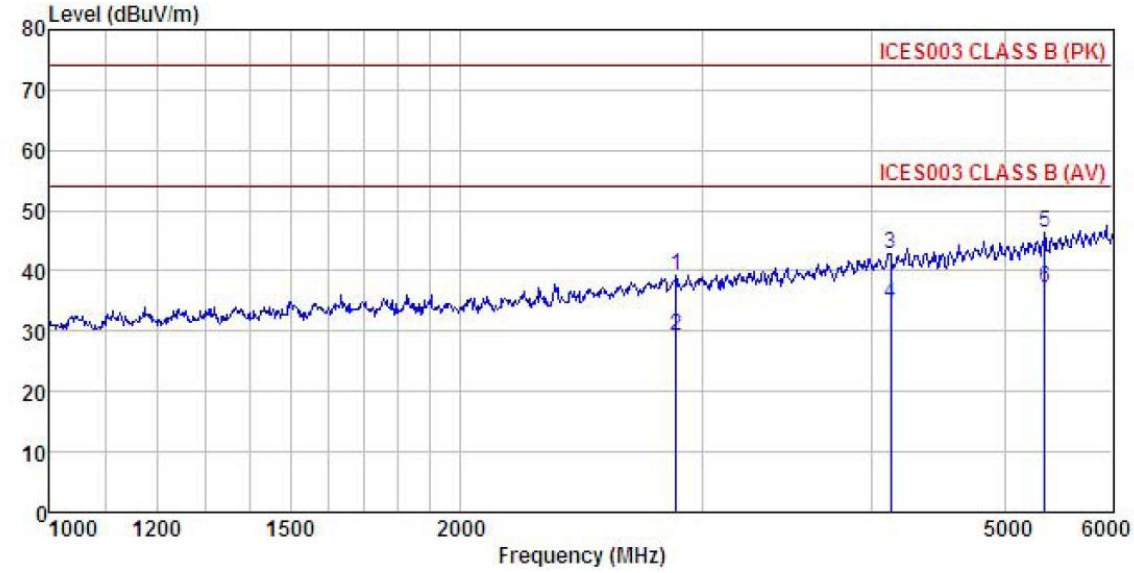


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2872.970	47.35	28.24	5.21	41.60	39.20	74.00	-34.80	Peak
2	2872.970	37.45	28.24	5.21	41.60	29.30	54.00	-24.70	Average
3	4125.890	48.07	30.33	6.29	41.81	42.88	74.00	-31.12	Peak
4	4125.890	39.73	30.33	6.29	41.81	34.54	54.00	-19.46	Average
5	5349.948	48.84	32.25	7.11	41.89	46.31	74.00	-27.69	Peak
6	5349.948	39.85	32.25	7.11	41.89	37.32	54.00	-16.68	Average

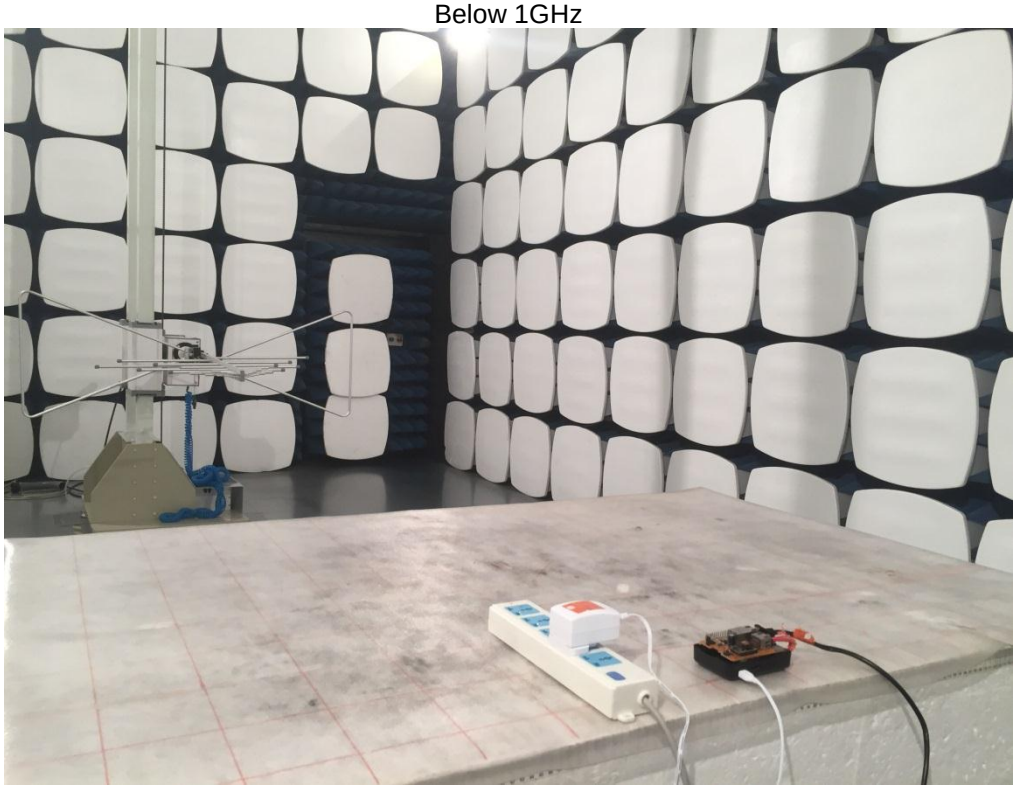
Remark:

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.*

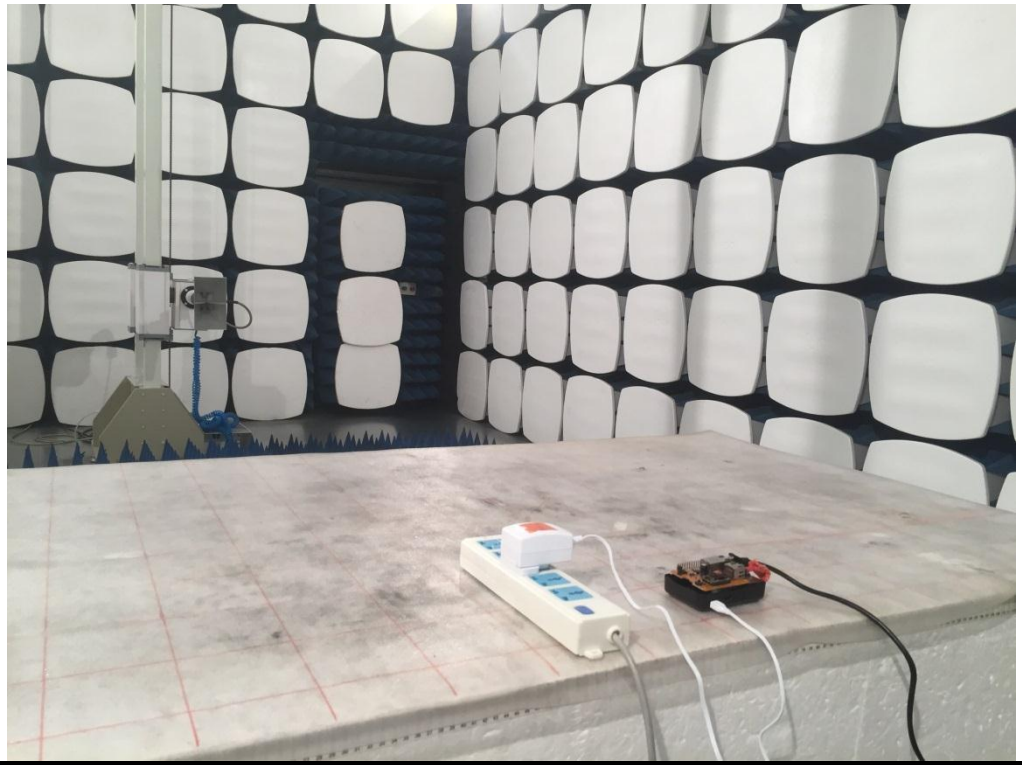
7 Test Setup Photo

Radiated Emission

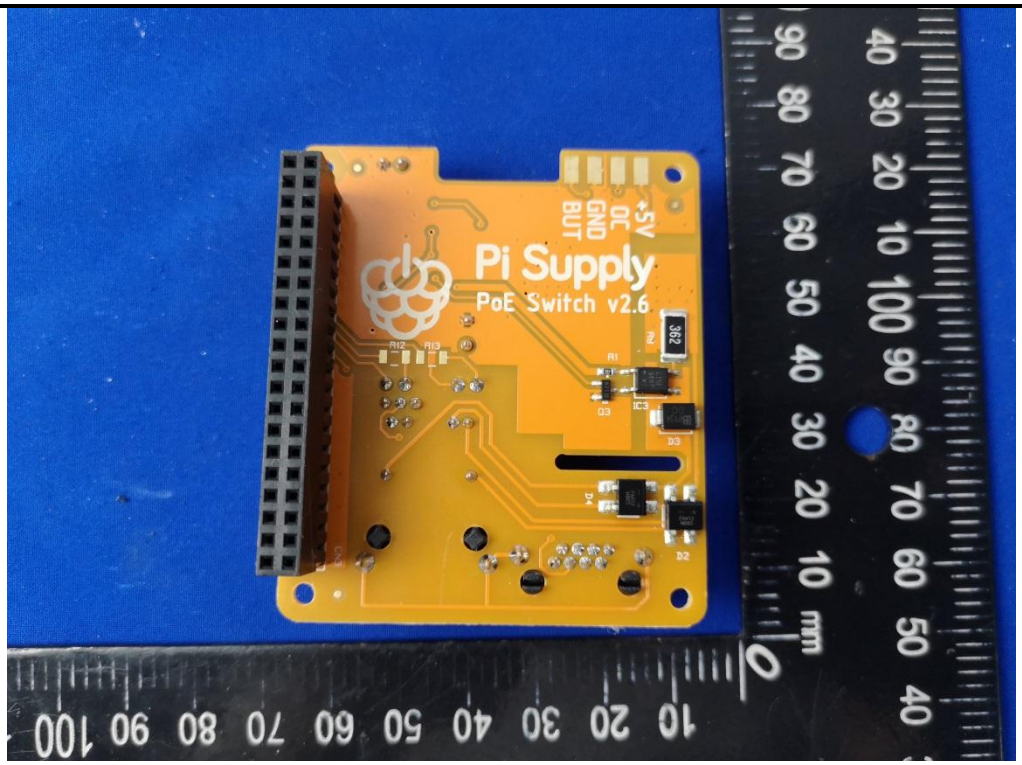
Below 1GHz

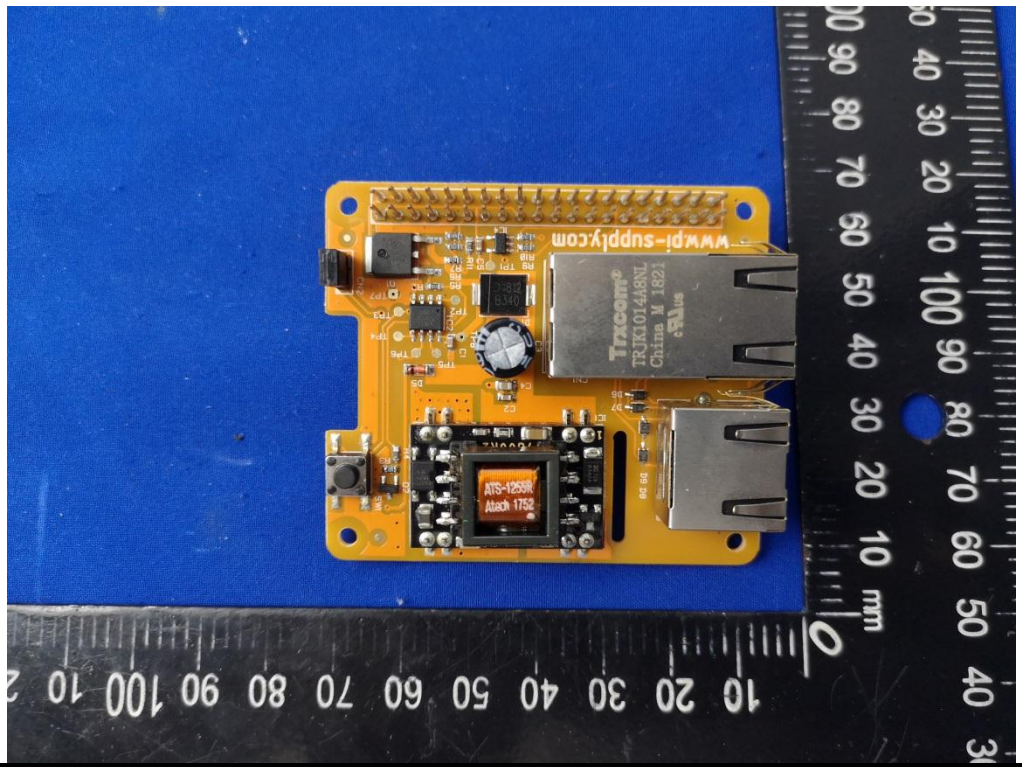


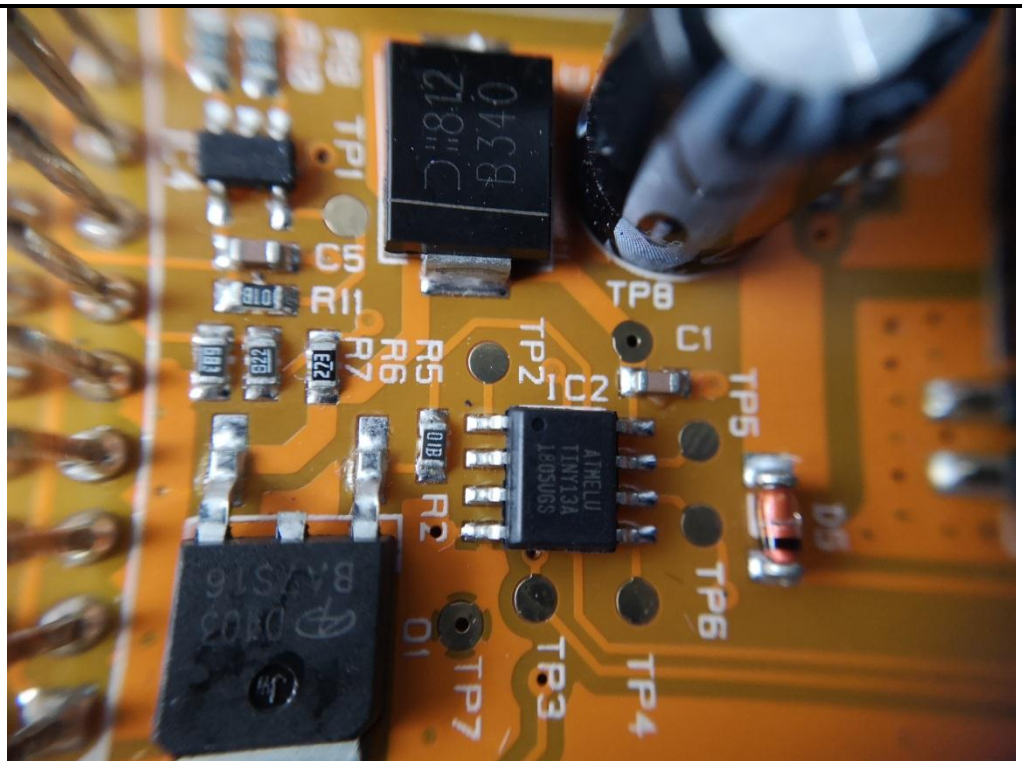
Above 1GHz



8 EUT Constructional Details






TP1
C5
R11
R5
R6
R7
R2
TP2
IC2
TP8
C1
TP5
D3
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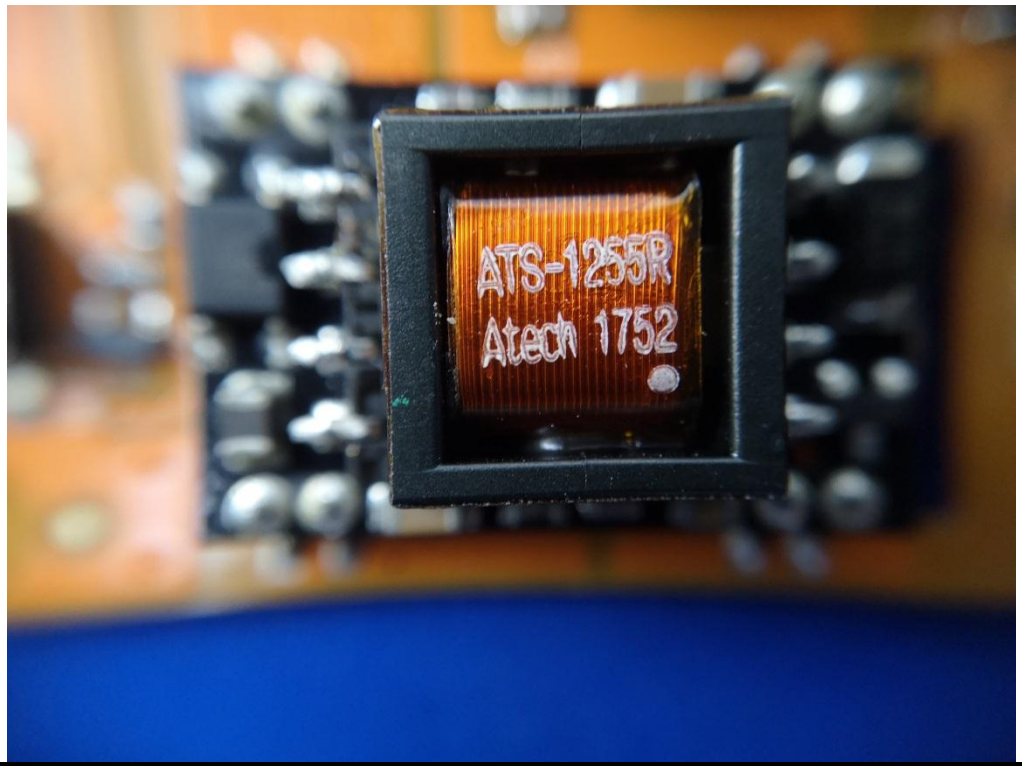
TB3
TP7
D1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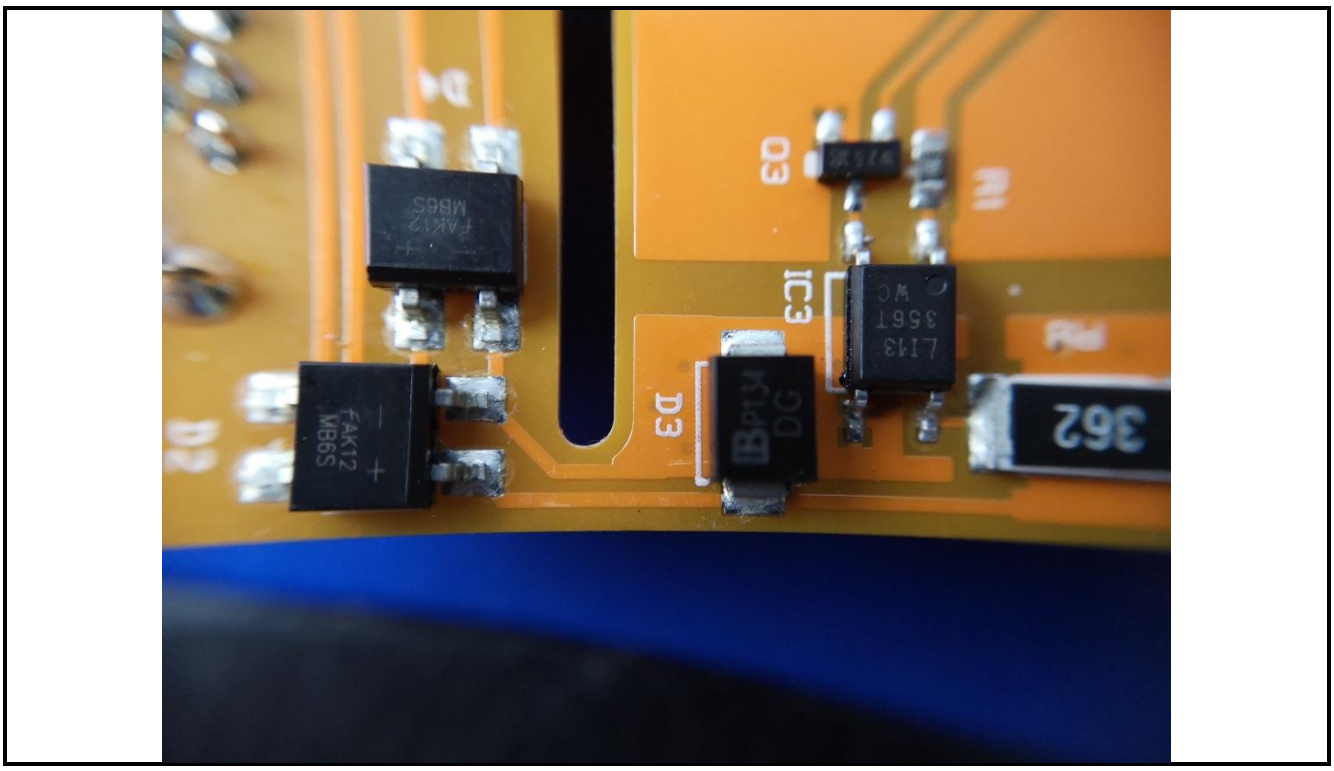
Atech 1752



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