IC REPORT

Applicant: Balena Ltd.

Address of Applicant: 6th Floor, One London Wall London, London, EC2Y 5EB United Kingdom

Equipment Under Test (EUT)

Product Name: balenaFin

Model No.: v1.1

HVIN: FINV10

Trade mark: balenaFin

Applicable standards: ICES-003 Issue 6 Published: January 2016 Updated: April 2019

Date of sample receipt: 23 Aug., 2019

Date of Test: 24 Aug., to 26 Dec., 2019

Date of report issued: 12 Jan., 2021

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 JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	*03 Dec., 2020*	*Original*
01	*12 Jan., 2021*	*Add HVIN*

Tested by: Mike.ou ***Date:*** *12 Jan., 2021*

Test Engineer

Reviewed by: Winner Zhang ***Date:*** *12 Jan., 2021*

Project Engineer

3 Contents

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4 Test Summary

Test Item	Section	Result
Conducted Emission	ICES-003 Section 6.1	Pass
Radiated Emission	ICES-003 Section 6.2	Pass

Remark:

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

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

Test Method:	*ANSI C63.4:2014*

5 General Information

5.1 Client Information

Applicant:	Balena Ltd.
Address:	6th Floor, One London Wall London, London, EC2Y 5EB United Kingdom
Manufacturer:	Balena Ltd.
Address:	6th Floor, One London Wall London, London, EC2Y 5EB United Kingdom
Factory:	Fae Technology S.p.a.
Address:	Via C. Battisti, 136 Gazzaniga (BG) 24025 - Italia

5.2 General Description of E.U.T.

Product Name:	balenaFin
Model No.:	v1.1
Power supply:	DC6V-24V
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

5.3 Test Mode

Operating mode	Detail description
Working mode	Keep the EUT in Working mode(Worst case)
LAN link mode	Keep the EUT in LAN link receiver 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)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.5 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
MERCURY	Wireless router	MW150R	12922104015	FCC ID
NAKAMICHI	Bluetooth earphone	T8	N/A	FCC ID
Skyworth	Color LCD TV	24E12HR	K026709	N/A
HUAWEI	Wireless Router	HiRouter-H1	N/A	N/A

5.6 Related Submittal(s) / Grant (s)

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

5.7 Additions to, deviations, or exclusions from the method

No

5.8 Laboratory Facility

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

- **FCC - Designation No.: CN1211**

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

- **ISED – CAB identifier.: CN0021**

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

- **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

JianYan Testing Group Shenzhen Co., Ltd.
Address: No.110~116, Building B, Jinyuan Business Building, 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

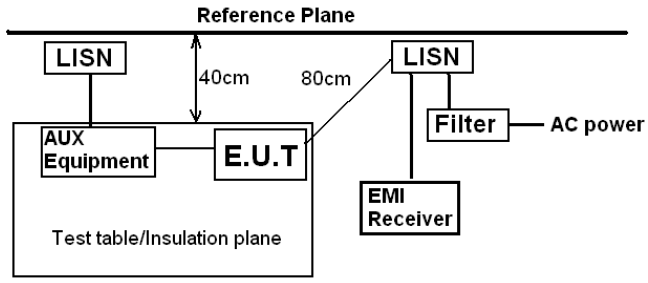
5.10 Test Instruments list

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
				11-20-2019	11-19-2020
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
				11-20-2019	11-19-2020
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

Conducted Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-18-2019	03-17-2020
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-18-2019	03-17-2020
LISN	CHASE	MN2050D	1447	03-18-2019	03-17-2020
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2018	07-20-2021
Cable	HP	10503A	N/A	03-18-2019	03-17-2020
EMI Test Software	AUDIX	E3	Version: 6.110919b		

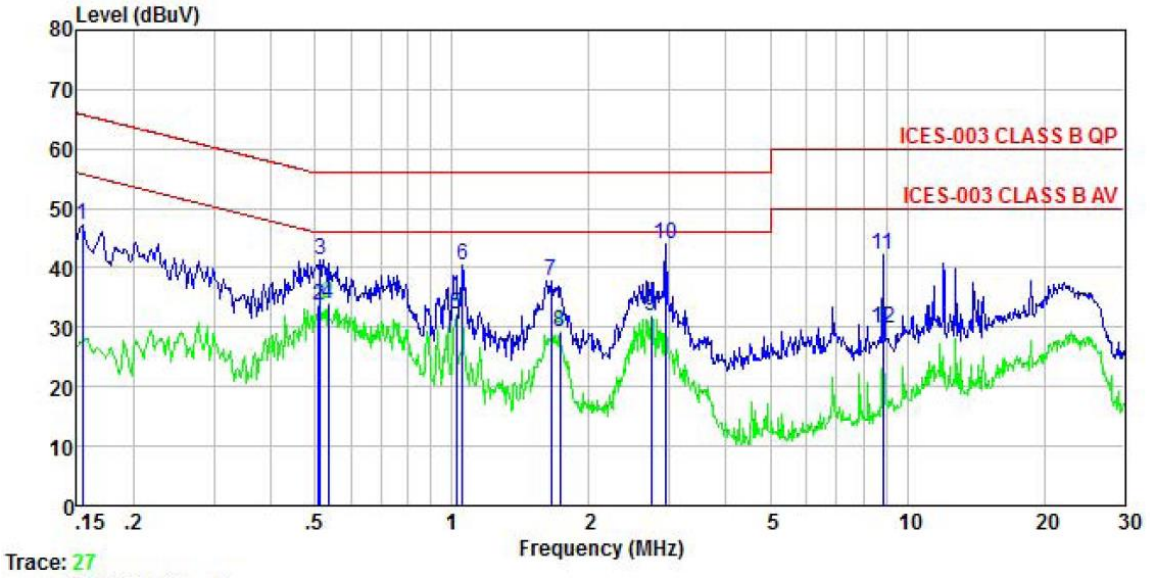
6 Test results and Measurement Data

6.1 Conducted Emission

Test Requirement:	ICES-003 Section 6.1		
Test Frequency Range:	150kHz to 30MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBµV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	0.5-30	60	50
	* Decreases with the logarithm of the frequency.		
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*		
Test procedure	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4(latest version) on conducted measurement.		
Test Instruments:	Refer to section 5.11 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement data:

Product name:	balenaFin	Product model:	v1.1
Test by:	Carey	Test mode:	Working mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Huni: 55%

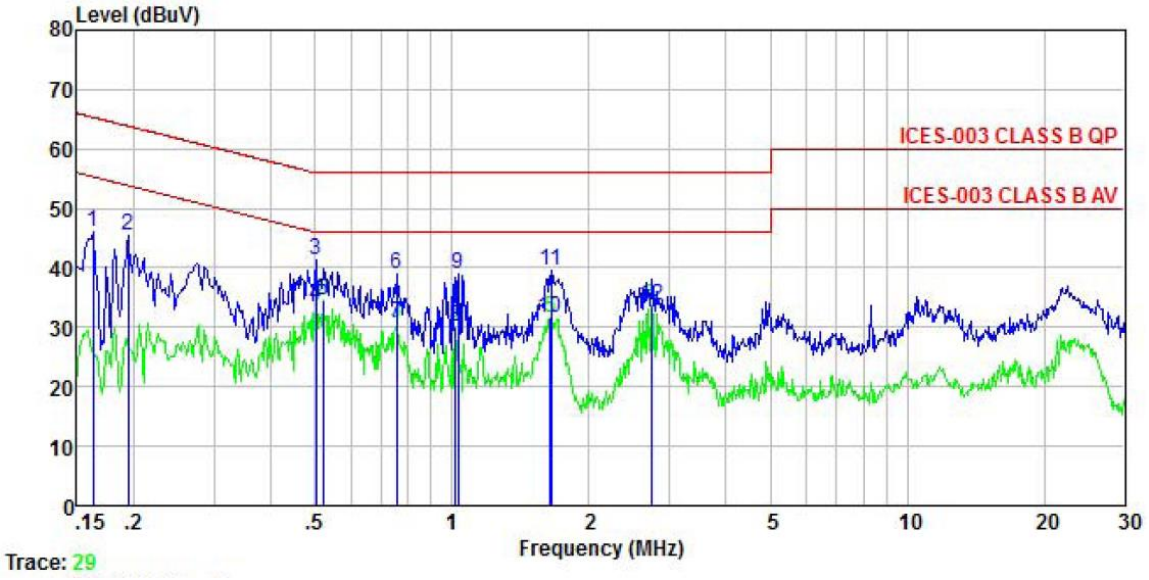


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.154	37.21	-0.57	-0.06	10.78	47.36	65.78	-18.42	QP
2	0.510	23.68	-0.44	-0.35	10.76	33.65	46.00	-12.35	Average
3	0.513	31.34	-0.44	-0.35	10.76	41.31	56.00	-14.69	QP
4	0.535	24.05	-0.45	-0.36	10.76	34.00	46.00	-12.00	Average
5	1.021	21.50	-0.62	0.44	10.87	32.19	46.00	-13.81	Average
6	1.054	29.71	-0.61	0.40	10.88	40.38	56.00	-15.62	QP
7	1.654	27.64	-0.54	-0.11	10.94	37.93	56.00	-18.07	QP
8	1.725	18.97	-0.53	-0.15	10.94	29.23	46.00	-16.77	Average
9	2.736	21.62	-0.45	-0.23	10.93	31.87	46.00	-14.13	Average
10	2.946	33.85	-0.43	-0.21	10.92	44.13	56.00	-11.87	QP
11	8.822	30.31	-0.67	1.72	10.89	42.25	60.00	-17.75	QP
12	8.822	17.85	-0.67	1.72	10.89	29.79	50.00	-20.21	Average

Notes:

1. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.*

Product name:	balenaFin	Product model:	v1.1
Test by:	Carey	Test mode:	Working mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Huni: 55%



	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.162	35.83	-0.68	0.01	10.77	45.93	65.34	-19.41	QP
2	0.194	35.28	-0.67	0.00	10.76	45.37	63.84	-18.47	QP
3	0.502	31.28	-0.65	0.03	10.76	41.42	56.00	-14.58	QP
4	0.502	23.56	-0.65	0.03	10.76	33.70	46.00	-12.30	Average
5	0.521	24.32	-0.65	0.03	10.76	34.46	46.00	-11.54	Average
6	0.755	28.84	-0.65	0.05	10.79	39.03	56.00	-16.97	QP
7	0.755	20.55	-0.65	0.05	10.79	30.74	46.00	-15.26	Average
8	1.016	19.85	-0.68	0.08	10.87	30.12	46.00	-15.88	Average
9	1.032	28.55	-0.68	0.08	10.87	38.82	56.00	-17.18	QP
10	1.645	21.12	-0.70	0.14	10.93	31.49	46.00	-14.51	Average
11	1.654	29.04	-0.70	0.15	10.94	39.43	56.00	-16.57	QP
12	2.736	22.99	-0.66	0.28	10.93	33.54	46.00	-12.46	Average

Notes:

1. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.*

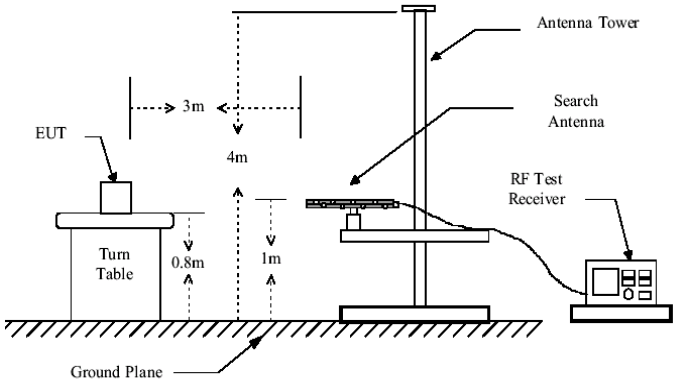
6.2 Radiated Emission

Test Requirement:	ICES-003 Section 6.2				
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	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value

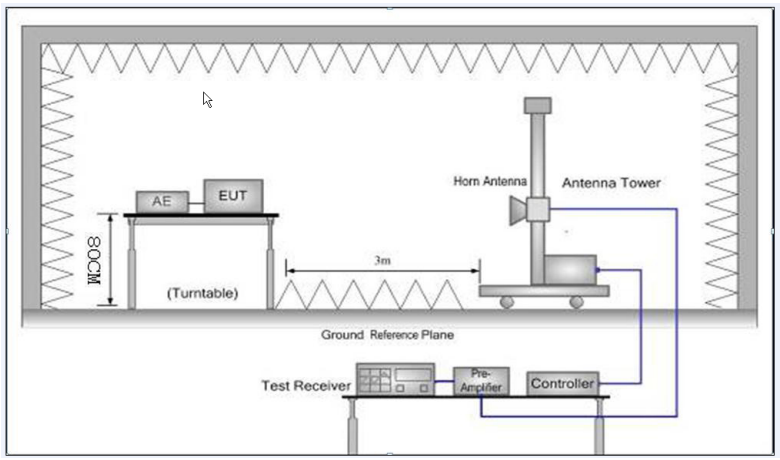
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value

Test setup:

Below 1GHz



Above 1GHz



Test Procedure:

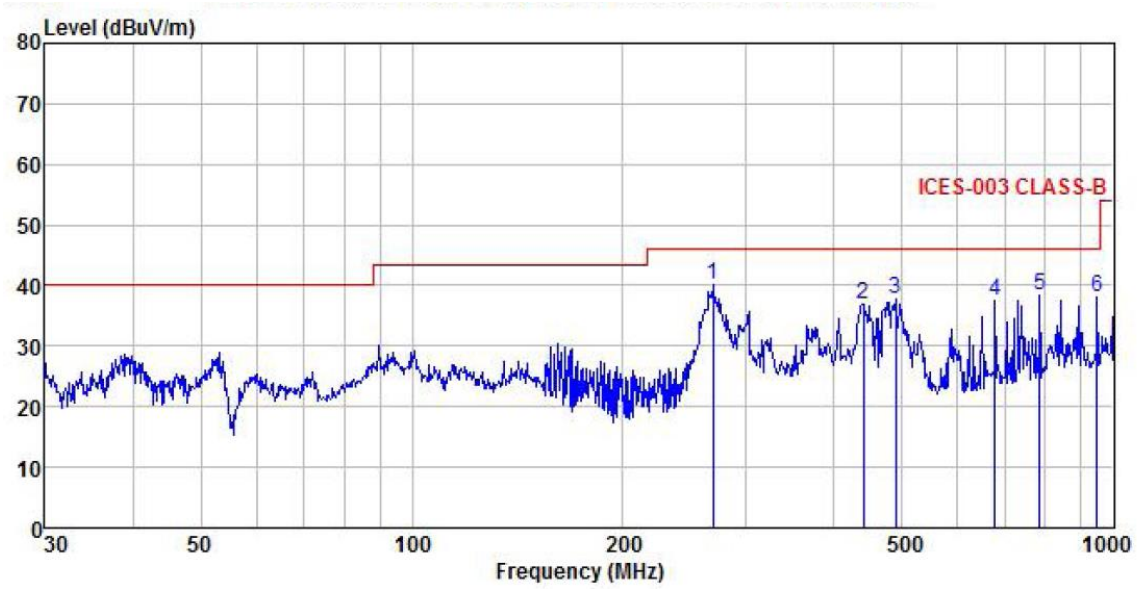
1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the 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 5.11 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:

Below 1GHz:

Product Name:	balenaFin	**Product Model:**	V1.1
Test By:	Carey	**Test mode:**	Working mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

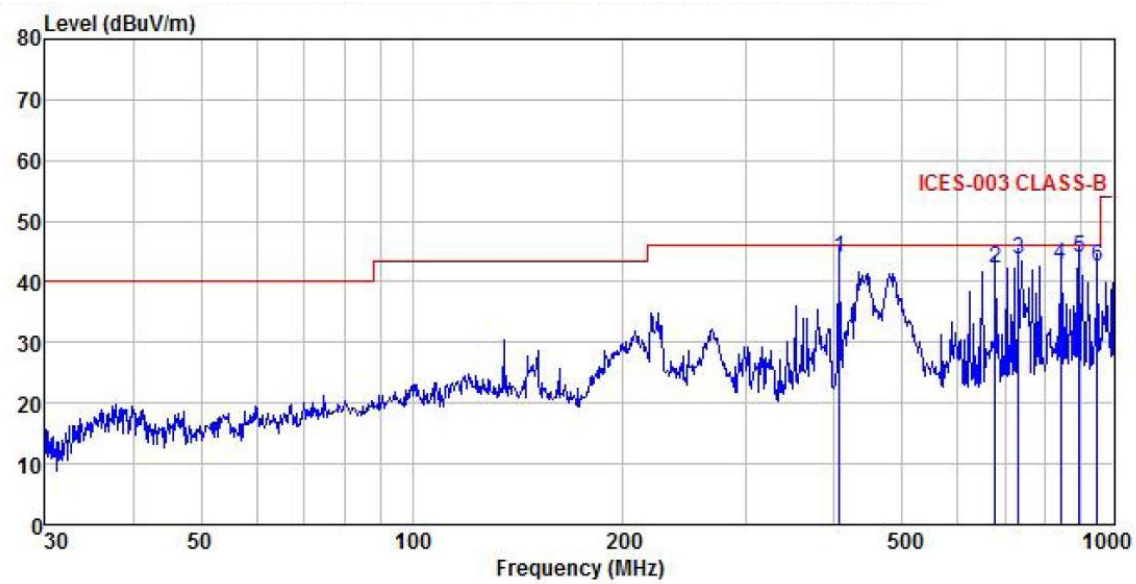


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	268.485	47.23	18.58	2.86	0.00	28.51	40.16	46.00	-5.84	QP
2	440.196	43.37	19.18	3.18	0.00	28.85	36.88	46.00	-9.12	QP
3	489.027	43.74	19.36	3.53	0.00	28.93	37.70	46.00	-8.30	QP
4	677.580	41.73	20.33	4.04	0.00	28.72	37.38	46.00	-8.62	QP
5	785.093	41.53	20.82	4.35	0.00	28.28	38.42	46.00	-7.58	QP
6	948.761	38.67	22.80	4.20	0.00	27.73	37.94	46.00	-8.06	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss + Aux Factor – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The Aux Factor is a notch filter switch box loss, this item is not used.*

Product Name:	balenaFin	Product Model:	V1.1
Test By:	Carey	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%



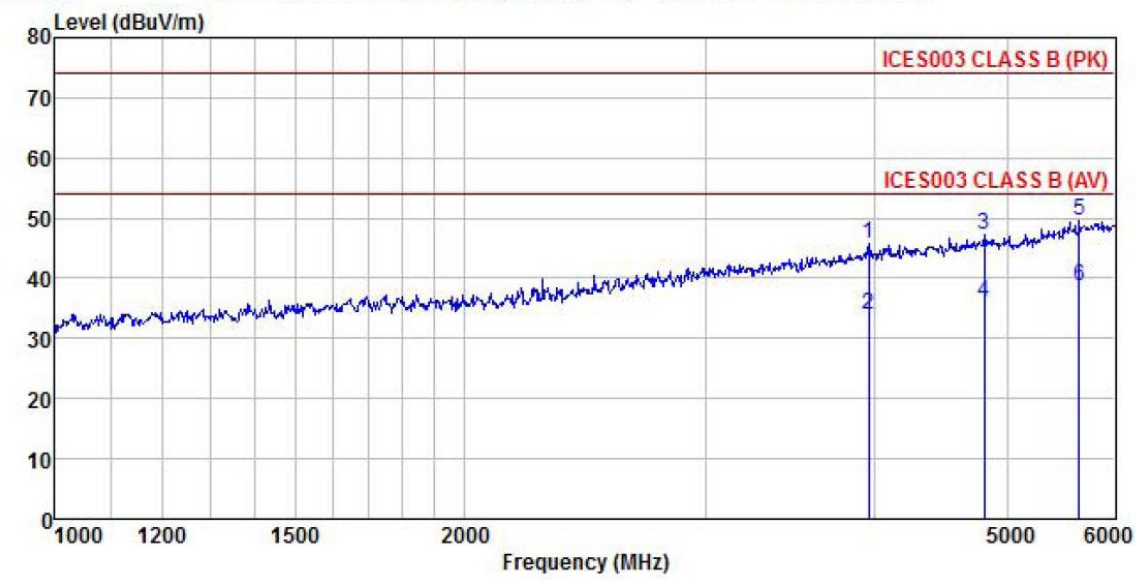
	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	406.088	50.71	19.11	3.09	0.00	28.79	44.12	46.00	-1.88	QP
2	677.580	46.71	20.33	4.04	0.00	28.72	42.36	46.00	-3.64	QP
3	731.920	47.28	20.57	4.29	0.00	28.55	43.59	46.00	-2.41	QP
4	839.182	45.32	21.29	4.22	0.00	28.04	42.79	46.00	-3.21	QP
5	893.857	45.57	22.45	3.77	0.00	27.89	43.90	46.00	-2.10	QP
6	948.761	43.20	22.80	4.20	0.00	27.73	42.47	46.00	-3.53	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss + Aux Factor – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The Aux Factor is a notch filter switch box loss, this item is not used.*

Above 1GHz:

Product Name:	balenaFin	**Product Model:**	V1.1
Test By:	Carey	**Test mode:**	Working mode
Test Frequency:	1 GHz ~ 6 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

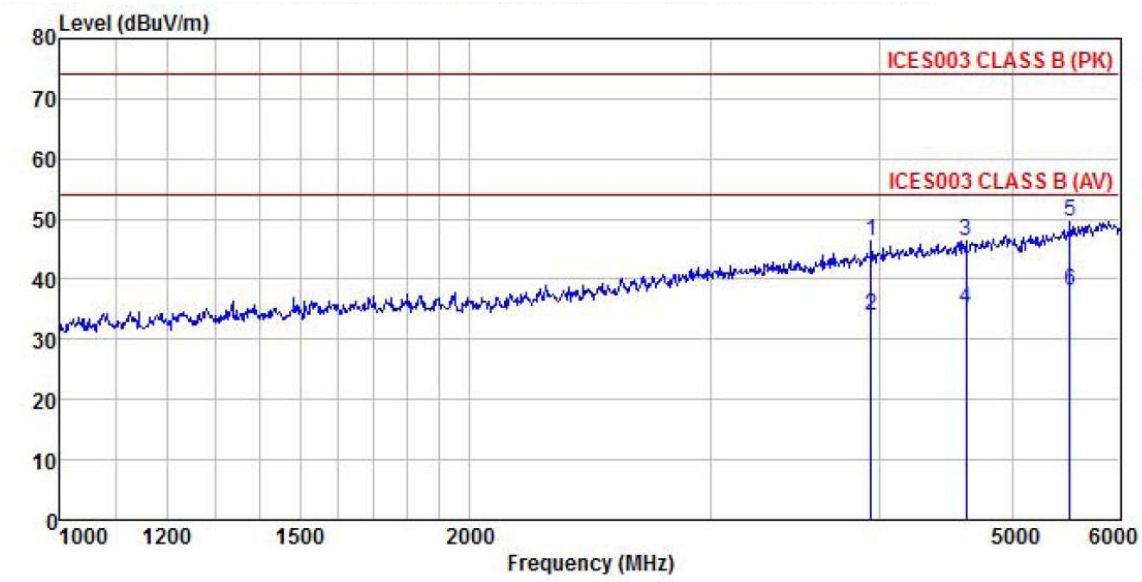


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	3959.316	49.91	29.25	6.10	2.20	41.81	45.65	74.00	-28.35	Peak
2	3959.316	38.28	29.25	6.10	2.20	41.81	34.02	54.00	-19.98	Average
3	4813.252	48.96	30.81	6.81	2.44	41.82	47.20	74.00	-26.80	Peak
4	4813.252	37.80	30.81	6.81	2.44	41.82	36.04	54.00	-17.96	Average
5	5645.392	48.85	32.36	7.45	2.69	41.85	49.50	74.00	-24.50	Peak
6	5645.392	37.88	32.36	7.45	2.69	41.85	38.53	54.00	-15.47	Average

Remark:

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

Product Name:	balenaFin	Product Model:	V1.1
Test By:	Carey	Test mode:	Working 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	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	3938.091	50.73	29.22	6.10	2.20	41.80	46.45	74.00	-27.55	Peak
2	3938.091	38.16	29.22	6.10	2.20	41.80	33.88	54.00	-20.12	Average
3	4627.211	48.86	30.40	6.89	2.40	42.10	46.45	74.00	-27.55	Peak
4	4627.211	37.40	30.40	6.89	2.40	42.10	34.99	54.00	-19.01	Average
5	5515.415	49.08	32.31	7.23	2.66	41.82	49.46	74.00	-24.54	Peak
6	5515.415	37.56	32.31	7.23	2.66	41.82	37.94	54.00	-16.06	Average

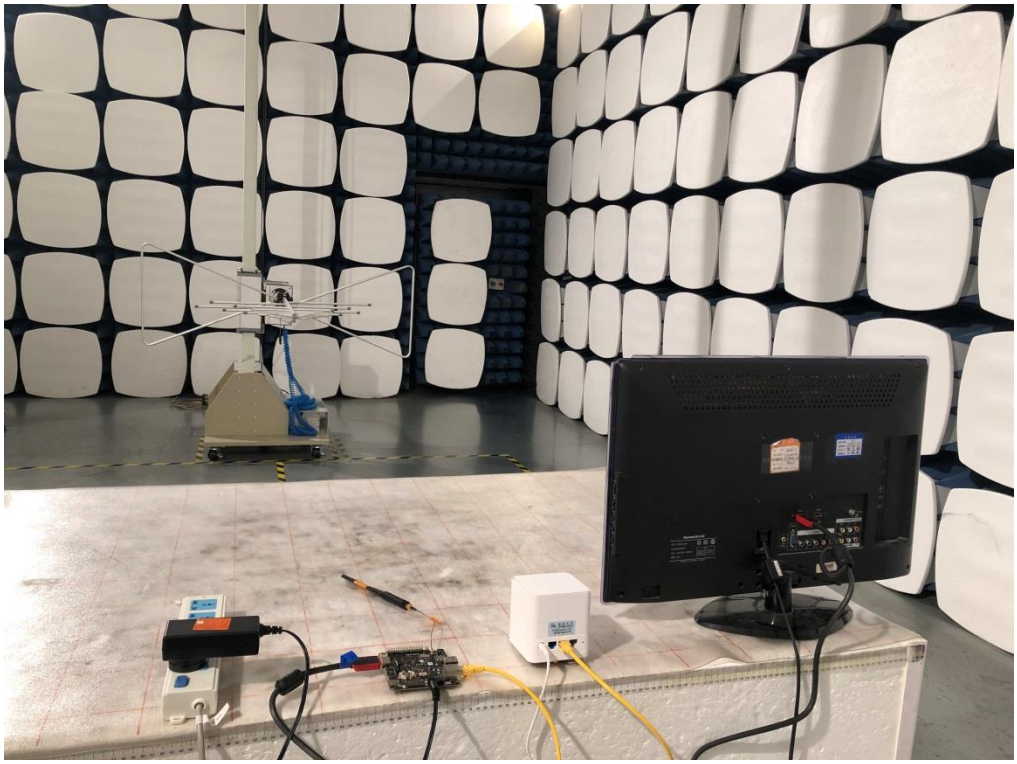
Remark:

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

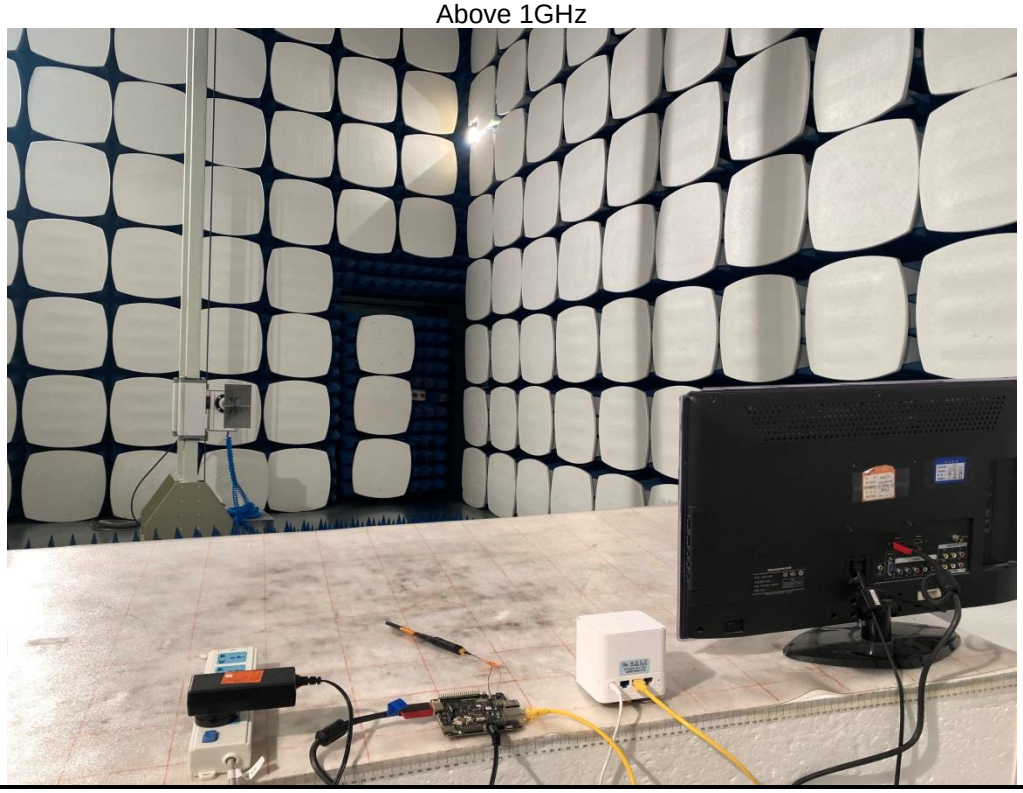
7 Test Setup Photo

Radiated Emission

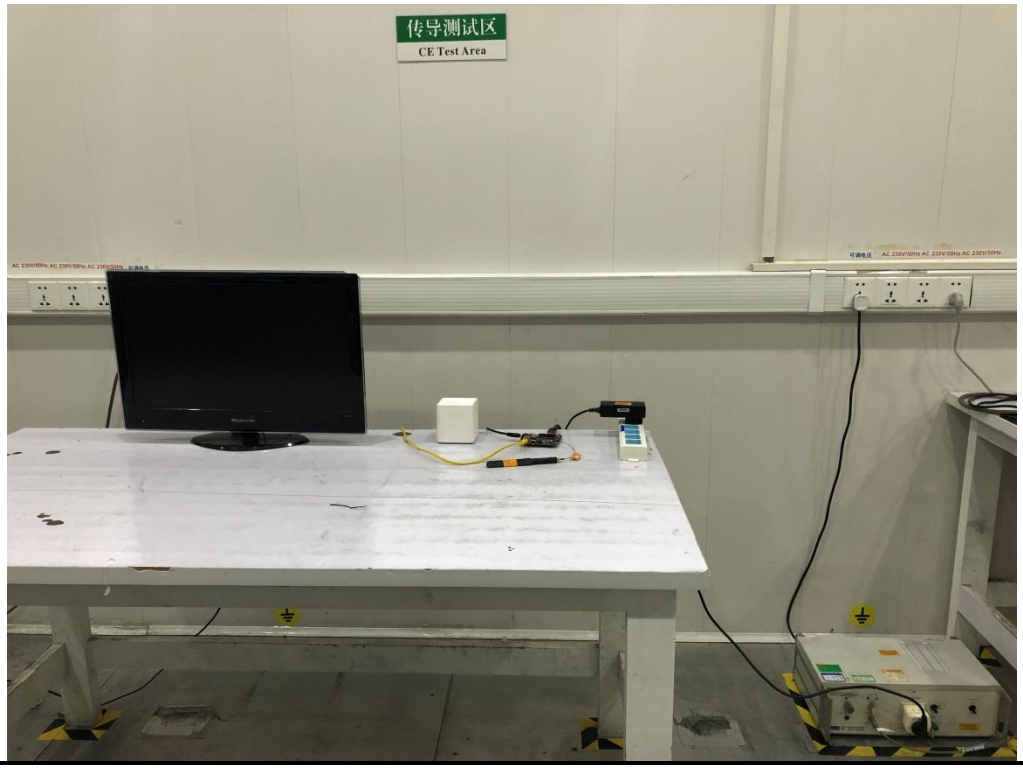
Below 1GHz



Above 1GHz



Conducted Emission



8 EUT Constructional Details

Reference to the test report No.: JYTSZE201205701

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