# TEST 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 |
| Trade mark: | balenaFin |
| **Applicable standards:** | EN 62311: 2008 |
| **Date of sample receipt:** | 23 Aug., 2019 |
| **Date of Test:** | 24 Aug., 2019 to 03 Aug., 2020 |
| **Date of report issue:** | 05 Aug., 2020 |
| **Test Result:** | PASS* |

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to health contained in Directive 2014/35/EU are considered.

.
.

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.

# 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *05 Aug., 2020* | *Original* |
| | | |
| | | |
| | | |
| | | |

***Tested by:*** Carey Chen ***Date:*** *05 Aug., 2020*

***Test Engineer***

***Reviewed by:*** Winner Zhang ***Date:*** *05 Aug., 2020*

***Project Engineer***

# 3 Contents

Page

# 4 General Information

## 4.1 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 |

## 4.2 General Description of E.U.T.

| | |
|---|---|
| Product Name: | balenaFin |
| Model No.: | v1.1 |
| Hardware version: | v10 |
| Software version: | v2.51 |
| BLE Specification | |
| Operation Frequency: | 2402MHz-2480MHz |
| Channel number: | 40 |
| Channel separation: | 2MHz |
| Modulation | GFSK |
| Antenna Type: | Internal Antenna<br>External Antenna |
| Antenna gain: | Internal Antenna: 1dBi<br>External Antenna: 2dBi |
| Bluetooth Specification | |
| Operation Frequency: | 2402MHz-2480MHz |
| Channel number: | 79 |
| Channel separation: | 1MHz |
| Modulation | GFSK, Pi/4DQPSK, 8DPSK |
| Antenna Type: | Internal Antenna<br>External Antenna |
| Antenna gain: | Internal Antenna: 1dBi<br>External Antenna: 2dBi |
| 2.4G WIFI Specification | |
| Operation Frequency: | 2412MHz-2472MHz |
| Channel number: | 13 for 802.11b/802.11g/802.11n(HT20) , 9 for 802.11n(HT40) |
| Channel separation: | 5MHz |
| Modulation technology:<br>(IEEE 802.11b) | Direct Sequence Spread Spectrum (DSSS) |
| Modulation technology:<br>(IEEE 802.11g/802.11n) | Orthogonal Frequency Division Multiplexing(OFDM) |
| Antenna Type: | Internal Antenna<br>External Antenna |
| Antenna gain: | Internal Antenna: 1dBi<br>External Antenna: 2dBi |

| 5G WIFI Specification | |
|---|---|
| Operation Frequency: | 5180MHz~5240MHz |
| Nominal Bandwidth | 20MHz, 40MHz, 80MHz |
| Channel Spacing: | 10MHz |
| Modulation: | OFDM |
| Antenna Type: | Internal Antenna<br>External Antenna |
| Antenna gain: | Internal Antenna: 1dBi<br>External Antenna: 2dBi |
| Test Sample Condition: | The test samples were provided in good working order with no visible defects. |

## 4.3 Operating Modes

| Operating mode | Detail description |
|---|---|
| BLE mode | Keep the EUT in continuously transmitting in BLE mode |
| BT mode | Keep the EUT in continuously transmitting in BT mode |
| 2.4G WIFI mode | Keep the EUT in continuously transmitting in 2.4G WIFI mode |
| 5G WIFI mode | Keep the EUT in continuously transmitting in 5G WIFI mode |

## 4.4 Description of Support Units

| Manufacturer | Description | Model | S/N | 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 |

## 4.5 Measurement Uncertainty

| Parameter | Expanded Uncertainty (Confidence of 95%) |
|---|---|
| RF output power, conducted | ±1.5 dB |

## 4.6 Additions to, deviations, or exclusions from the method

No

## 4.7 Laboratory Facility

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

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

Shenzhen Zhongjian Nanfang Testing 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 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.

- **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

## 4.8 Laboratory Location

Shenzhen Zhongjian Nanfang Testing 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

## 4.9 Test Instruments list

| **Conducted method:** | | | | | |
|---|---|---|---|---|---|
| **Test Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Cal. Date (mm-dd-yy)** | **Cal. Due date (mm-dd-yy)** |
| Spectrum Analyzer | Agilent | N9020A | MY50510123 | 11-18-2019 | 11-17-2020 |
| Vector Signal Generator | Agilent | N5182A | MY49060014 | 11-18-2019 | 11-17-2020 |
| Signal Generator | R&S | SMR20 | 1008100050 | 07-05-2019 | 03-04-2020 |
| | | | | 03-05-2020 | 03-04-2021 |
| Power Sensor | D.A.R.E | RPR3006W | 15I00041SNO12 | 11-25-2019 | 11-24-2020 |
| Power Sensor | D.A.R.E | RPR3006W | 15I00041SNO54 | 11-25-2019 | 11-24-2020 |
| Power Sensor | D.A.R.E | RPR3006W | 17I00015SNO27 | 11-25-2019 | 11-24-2020 |
| Power Sensor | D.A.R.E | RPR3006W | 17I00015SNO28 | 11-25-2019 | 11-24-2020 |
| RF Switch Unit | Ascentest | AT890-RFB | N/A | N/A | N/A |
| Test Software | MWRFTEST | MTS 8310 | Version: 2.0.0.0 | | |
| DC Power Supply | XinNuoEr | WYK-10020K | 1409050110020 | 09-25-2019 | 09-24- 2020 |
| Temperature Humidity Chamber | HengPu | HPGDS-500 | 20140828008 | 11-01-2019 | 10-31- 2020 |

# 5 Technical Requirements Specification in EN 62311

## 5.1 General Description of Applied Standards

EN 62311 Generic standard to demonstrate the compliance of electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (0 Hz–300 GHz) is to demonstrate the compliance of apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields as well as induced and contact current.

## 5.2 RF Exposure Evaluation

### 5.2.1 Limit

**Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz, unperturbed rms values)**

| Frequency range | E-field strength (V/m) | H-field strength (A/m) | B-field (μT) | Equivalent plane wave power density $S_{eq}$ (W/m²) |
|---|---|---|---|---|
| 0-1 Hz | — | $3,2 \times 10^4$ | $4 \times 10^4$ | — |
| 1-8 Hz | 10 000 | $3,2 \times 10^4/f^2$ | $4 \times 10^4/f^2$ | — |
| 8-25 Hz | 10 000 | 4 000/f | 5 000/f | — |
| 0,025-0,8 kHz | 250/f | 4/f | 5/f | — |
| 0,8-3 kHz | 250/f | 5 | 6,25 | — |
| 3-150 kHz | 87 | 5 | 6,25 | — |
| 0,15-1 MHz | 87 | 0,73/f | 0,92/f | — |
| 1-10 MHz | $87/f^{1/2}$ | 0,73/f | 0,92/f | — |
| 10-400 MHz | 28 | 0,073 | 0,092 | 2 |
| 400-2 000 MHz | $1,375\ f^{1/2}$ | $0,0037\ f^{1/2}$ | $0,0046\ f^{1/2}$ | f/200 |
| 2-300 GHz | 61 | 0,16 | 0,20 | 10 |

Notes:

1. $f$ as indicated in the frequency range column.

### 5.2.2 Test method

The antenna of the product, under normal use condition is at least 20cm away from the body of the user. Warning statement ot the user for keeing 20cm separation distance and the prohibition of operating to a person has been printed on the user manual. So, this product under normal use is located on electromagnetic far field between the human body.

**Far Field Calculation Formula**

$$E = \frac{\sqrt{30PG(\theta,\phi)}}{r}$$

G = antenna gain relative to an isotropic antenna
$\theta,\phi$ = elevation and azimuth angles to point of investigation
r = distance from observation point to the antenna

### 5.2.3 Measurement data(worst case):

| Modulation | Output Power (dBm) | Output Power (mW) | Antenna Gain (dBi) | Antenna Gain (numeric) | E Field Strength (V/m) | E Field Strength Limit (V/m) | Result |
|---|---|---|---|---|---|---|---|
| **Maximum Emissions Level of Bluetooth** | | | | | | | |
| GFSK Mode | 1.46 | 1.400 | 2.0 | 1.58 | 1.290 | 61 | Pass |
| Pi/4DQPSK Mode | -0.76 | 0.839 | 2.0 | 1.58 | 0.999 | 61 | Pass |
| 8DPSK Mode | -1.79 | 0.662 | 2.0 | 1.58 | 0.887 | 61 | Pass |
| **Maximum Emissions Level of BLE** | | | | | | | |
| GFSK Mode | -1.16 | 0.766 | 2.0 | 1.58 | 0.954 | 61 | Pass |
| **Maximum Emissions Level of 2.4G WIFI** | | | | | | | |
| 802.11b mode | 13.32 | 21.478 | 2.0 | 1.58 | 5.053 | 61 | Pass |
| 802.11g mode | 11.54 | 14.256 | 2.0 | 1.58 | 4.117 | 61 | Pass |
| 802.11n-HT20 | 11.50 | 14.125 | 2.0 | 1.58 | 4.098 | 61 | Pass |
| 802.11n-HT40 | 9.54 | 8.995 | 2.0 | 1.58 | 3.270 | 61 | Pass |
| **Maximum Emissions Level of 5G WIFI** | | | | | | | |
| 802.11a | 4.40 | 2.754 | 2.0 | 1.58 | 1.809 | 61 | Pass |
| 802.11n-HT20 | 3.17 | 2.075 | 2.0 | 1.58 | 1.570 | 61 | Pass |
| 802.11n-HT40 | 2.03 | 1.596 | 2.0 | 1.58 | 1.377 | 61 | Pass |
| 802.11ac80 | 0.5 | 1.122 | 2.0 | 1.58 | 1.155 | 61 | Pass |

### 5.2.4 Conclusion

Meet the requirements of EN 62311:2008

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