# UKCA RF Test Report

**Applicant:** Nebra Ltd

**Address of Applicant:** Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells, East Sussex, TN3 9BJ

**Equipment Under Test (EUT)**

Product Name: Nebra Indoor LoRa Gateway ROCK Pi 4 Version / Nebra Indoor Helium Hotspot ROCK Pi 4 Version

Model No.: NEBHNT-HHRK4-433, NEBHNT-HHRK4-470, NEBHNT-HHRK4-868, NEBHNT-HHRK4-915, NEBHNT-HHRK4-433-2, NEBHNT-HHRK4-470-2, NEBHNT-HHRK4-868-2, NEBHNT-HHRK4-915-2, NEBHNT-HHRK4-433-3, NEBHNT-HHRK4-470-3, NEBHNT-HHRK4-868-3, NEBHNT-HHRK4-915-3, NEBHNT-HHRK4-433-3, NEBHNT-HHRK4-470-3, NEBHNT-HHRK4-868-3, NEBHNT-HHRK4-915-3

**Applicable standards:** BS EN IEC 62311: 2020

**Date of sample receipt:** 05 Jan., 2022

**Date of Test:** 06 Jan., to 24 Jan., 2022

**Date of report issue:** 25 Jan., 2022

**Test Result:** PASS



| | | | |
|---|---|---|---|
| ***Tested by:*** | ***Test Engineer*** | ***Date:*** | *25 Jan., 2022* |
| ***Reviewed by:*** | ***Project Engineer*** | ***Date:*** | *25 Jan., 2022* |
| ***Approved by:*** | ***Manager*** | ***Date:*** | *25 Jan., 2022* |

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

## 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *25 Jan., 2022* | *Original* |
| | | |
| | | |
| | | |
| | | |

# 3 Contents

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# 4 General Information

## 4.1 Client Information

| | |
|---|---|
| Applicant: | Nebra Ltd |
| Address: | Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells, East Sussex, TN3 9BJ |
| Manufacturer/Factory: | Nebra Ltd |
| Address: | Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells, East Sussex, TN3 9BJ |

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

| | |
|---|---|
| Product Name: | Nebra Indoor LoRa Gateway ROCK Pi 4 Version / Nebra Indoor Helium Hotspot ROCK Pi 4 Version |
| Model No.: | NEBHNT-HHRK4-433, NEBHNT-HHRK4-470, NEBHNT-HHRK4-868, NEBHNT-HHRK4-915, NEBHNT-HHRK4-433-2, NEBHNT-HHRK4-470-2, NEBHNT-HHRK4-868-2, NEBHNT-HHRK4-915-2, NEBHNT-HHRK4-433-3, NEBHNT-HHRK4-470-3, NEBHNT-HHRK4-868-3, NEBHNT-HHRK4-915-3, NEBHNT-HHRK4-433-3, NEBHNT-HHRK4-470-3, NEBHNT-HHRK4-868-3, NEBHNT-HHRK4-915-3 |
| Hardware version: | v1 |
| Software version: | 781099d |
| BLE Specification | |
| Operation Frequency: | 2402MHz-2480MHz |
| Channel number: | 40 |
| Channel separation: | 2MHz |
| Modulation | GFSK |
| Antenna Type: | External Antenna |
| Antenna gain: | 1 dBi (declare by Applicant) |
| Bluetooth Specification | |
| Operation Frequency: | 2402MHz-2480MHz |
| Channel number: | 79 |
| Channel separation: | 1MHz |
| Modulation | GFSK, Pi/4DQPSK, 8DPSK |
| Antenna Type: | External Antenna |
| Antenna gain: | 1 dBi (declare by Applicant) |
| 2.4G WiFi Specification | |
| Operation Frequency: | 2412MHz-2472MHz |
| Channel number: | 13 for 802.11b/802.11g/802.11n-HT20 |
| Channel separation: | 5MHz |
| Modulation technology: (IEEE 802.11b) | Direct Sequence Spread Spectrum (DSSS) |
| Modulation technology: (IEEE 802.11g/802.11n) | Orthogonal Frequency Division Multiplexing(OFDM) |
| Antenna Type: | External Antenna |
| Antenna gain: | 1 dBi (declare by Applicant) |

| 5.2 GWiFi Specification | |
|---|---|
| Operation Frequency: | 5180MHz~5240MHz |
| Nominal Bandwidth | 20MHz, 40MHz, 80MHz |
| Channel Spacing: | 10MHz |
| Modulation: | OFDM |
| Antenna Type: | External Antenna |
| Antenna gain: | 1 dBi (declare by Applicant) |
| Lora Specification | |
| Operation Frequency: | 868.1MHz~868.5MHz |
| Channel number: | 5 |
| Modulation : | OOK |
| Antenna Type : | External Antenna |
| Antenna gain : | 1 dBi (declare by Applicant) |

## 4.3 Test Mode

| 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 |
| WIFI mode | Keep the EUT in continuously transmitting in WIFI mode |
| Lora | Keep the EUT in continuously transmitting in Lora mode |

## 4.4 Description of Support Units

The EUT has been tested as an independent unit.

## 4.5 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 and 10m 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.

- **CNAS - Registration No.: CNAS L15527**

JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527.

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

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 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

## 4.6 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.
Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info-JYTee@lets.com, Website: http://jyt.lets.com

## 4.7 Test Instruments list

*Please refer to the report No.: BCTC2109795863-3E & BCTC2109795863-4E & BCTC2109795863-5E & BCTC2109795863-6E issu by Shenzhen BCTC Testing Co., Ltd, SZAWW180830005-04W issu by Shenzhen Anbotek Compliance Laboratory Limited*

# 5 Technical Requirements Specification

## General Description of Applied Standards

BS EN IEC 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.

## RF Exposure Evaluation 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.

## 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

**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 | 2.51 | 1.78 | 1 | 1.26 | 1.30 | 61 | Pass |
| **Maximum Emissions Level of BLE** | | | | | | | |
| GFSK Mode | -1.69 | 0.68 | 1 | 1.26 | 0.80 | 61 | Pass |
| **Maximum Emissions Level of 2.4G WIFI** | | | | | | | |
| 802.11b mode | 8.94 | 7.83 | 1 | 1.26 | 2.72 | 61 | Pass |
| **Maximum Emissions Level of 5G WIFI** | | | | | | | |
| 802.11a | 8.14 | 6.52 | 1 | 1.26 | 2.48 | 61 | Pass |
| **Maximum Emissions Level of Lora** | | | | | | | |
| OOK | 12.836 | 19.21 | 3 | 2.00 | 5.36 | 40.51 | Pass |

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