TEST REPORT

Applicant:	Nebra LTD.
Address of Applicant:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells TN3 9BJ United Kingdom

Equipment Under Test (EUT)

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner
Model No.:	HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+, HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868
Trade mark:	Nebra
Applicable standards:	EN 62311: 2020
Date of sample receipt:	31 May, 2021
Date of Test:	31 May, to 08 Jul., 2021
Date of report issue:	09 Jul., 2021
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 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.

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	*09 Jul., 2021*	*Original*

Tested by: Carey Chen ***Date:*** *09 Jul., 2021*

Test Engineer

Reviewed by: Winner Zhang ***Date:*** *09 Jul., 2021*

Project Engineer

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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 TN3 9BJ United Kingdom
Manufacturer:	Nebra LTD.
Address:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells TN3 9BJ United Kingdom
Factory:	SUNSOAR TECH CO., LIMITED
Address:	4/F, Block E, Fengze Building, Huafeng No.2 Industrial Park, Hangkong Road, XiXiang Town, BaoAn District, Shenzhen, China

4.2 General Description of E.U.T.

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner
Model No.:	HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+, HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868
Hardware version:	V01-16-2021-1820
Software version:	4dc8745
BLE Specification	
Operation Frequency:	2402MHz-2480MHz
Channel number:	40
Channel separation:	2MHz
Modulation	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	2 dBi (declare by Applicant)
Bluetooth Specification	
Operation Frequency:	2402MHz-2480MHz
Channel number:	79
Channel separation:	1MHz
Modulation	GFSK, Pi/4DQPSK, 8DPSK
Antenna Type:	PCB Antenna
Antenna gain:	2.0 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:	12.0 dBi (declare by Applicant)
LoRa Specification	
Operation Frequency:	868.1MHz-868.5 MHz

Modulation:	OOK		
Antenna type:	External antenna		
Antenna Gain:	3.0dBi		
GSM Specification			
Operation Frequency:	E-GSM900	Tx: 880---915MHz	Rx: 925---960 MHz
	DCS1800:	Tx: 1710---1785 MHz	Rx: 1805---1880 MHz
Antenna Type:	External antenna		
Antenna gain:	E-GSM900: 1.99dBi, DCS 1800: 2.31dBi		
WCDMA Specification			
Operation Frequency:	Band I:	Tx: 1920 MHz~1980 MHz	Rx: 2110 MHz~2170 MHz
	Band VIII:	Tx: 880 MHz~915 MHz	Rx: 925 MHz~960 MHz
	Band V:	Tx: 824 MHz~849 MHz	Rx: 869 MHz~894 MHz
Antenna Type:	External antenna		
Antenna gain:	Band I: 2.39dBi, Band VIII: 1.99dBi, Band V: 1.75dBi		
LTE Specification			
Operation Frequency:	LTE band1	Tx: 1920MHz~1980MHz	Rx: 2110MHz~2170MHz
	LTE band3	Tx: 1710MHz~1785MHz	Rx: 1805MHz~1880MHz
	LTE band5	Tx: 824MHz~849MHz	Rx: 869MHz~894MHz
	LTE band7	Tx: 2500MHz~2570MHz	Rx: 2620MHz~2690MHz
	LTE band8	Tx: 880MHz~915MHz	Rx: 925MHz~960MHz
	LTE band20	Tx: 832MHz~862MHz	Rx: 791MHz~821MHz
	LTE band28	Tx: 703MHz~748MHz	Rx: 758MHz~803MHz
	LTE band38	Tx: 2570MHz~2620MHz	Rx: 2570MHz~2620MHz
	LTE band40	Tx: 2300MHz~2400MHz	Rx: 2300MHz~2400MHz
Antenna Type:	External antenna		
Antenna gain:	Band 1: 2.39dBi, Band 3: 2.31dBi, Band 5: 1.75dBi, Band 7: 2.78dBi, Band 8: 1.99dBi, Band 20: 1.75dBi, Band 28: 1.75dBi, Band 40: 2.78dBi, Band 38: 2.78dBi		
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
LoRa mode	Keep the EUT in continuously transmitting in LoRa mode
GSM mode	Keep the EUT in continuously transmitting in GSM mode
WCDMA mode	Keep the EUT in continuously transmitting in WCDMA mode
LTE mode	Keep the EUT in continuously transmitting in lte mode

4.4 Description of Support Units

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**

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

4.8 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://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	11-27-2020	11-26-2021
Vector Signal Generator	Agilent	N5182A	MY49060014	11-27-2020	11-26-2021
Signal Generator	R&S	SMR20	1008100050	03-03-2021	03-02-2022
Power Sensor	D.A.R.E	RPR3006W	15I00041SNO12	11-27-2020	11-26-2021
Power Sensor	D.A.R.E	RPR3006W	15I00041SNO54	11-27-2020	11-26-2021
Power Sensor	D.A.R.E	RPR3006W	17I00015SNO27	11-27-2020	11-26-2021
Power Sensor	D.A.R.E	RPR3006W	17I00015SNO28	11-27-2020	11-26-2021
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	09-23-2020	09-22-2021
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-27-2020	11-26-2021

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	—	$3,2 \times 10^4$	4×10^4	—
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 35cm 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

θ, ϕ = 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	0.35	1.08	1.0	1.26	0.578	61	Pass
Pi/4DQPSK Mode	-0.95	0.80	1.0	1.26	0.498	61	Pass
8DPSK Mode	-0.16	0.96	1.0	1.26	0.545	61	Pass
Maximum Emissions Level of BLE							
GFSK Mode	2.42	1.75	1.0	1.26	0.734	61	Pass
Maximum Emissions Level of 2.4G WIFI							
802.11b mode	-3.31	0.47	12.0	15.85	1.346	61	Pass
802.11g mode	-3.47	0.45	12.0	15.85	1.321	61	Pass
802.11n-HT20	-4.37	0.37	12.0	15.85	1.191	61	Pass
802.11n-HT40	-4.36	0.37	12.0	15.85	1.193	61	Pass
Maximum Emissions Level of LoRa							
LoRa Mode	9.84	9.64	3.0	2.00	6.116	40.51	Pass
Maximum Emissions Level of GSM							
GSM 900	25.81	381.07	12.0	15.85	38.459	40.79	Pass
DCS 1800	22.81	190.99	12.0	15.85	27.227	56.86	Pass
Maximum Emissions Level of WCDMA							
WCDMA VIII	25.00	316.23	12.0	15.85	35.034	40.85	Pass
WCDMA V	25.00	316.23	12.0	15.85	35.034	39.53	Pass
WCDMA I	25.00	316.23	12.0	15.85	35.034	60.29	Pass
Maximum Emissions Level of LTE							
LTE band1	25.00	316.23	12.0	15.85	35.034	60.29	Pass
LTE band3	25.00	316.23	12.0	15.85	35.034	56.87	Pass
LTE band5	25.00	316.23	12.0	15.85	35.034	39.49	Pass
LTE band7	25.00	316.23	12.0	15.85	35.034	68.78	Pass
LTE band8	25.00	316.23	12.0	15.85	35.034	40.81	Pass
LTE band20	25.00	316.23	12.0	15.85	35.034	39.72	Pass
LTE band28	25.00	316.23	12.0	15.85	35.034	36.50	Pass
LTE band38	25.00	316.23	12.0	15.85	35.034	69.74	Pass
LTE band40	25.00	316.23	12.0	15.85	35.034	65.98	Pass

5.2.4 Conclusion

Meet the requirements of EN 62311:2020

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