FCC REPORT
(LoRa)

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

Equipment Under Test (EUT)

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner
Model No.:	HNTOUT-915-G-LT+, HNTOUT-915-G-LT, HNTOUT-915-LT+, HNTOUT-915 –LT, HNTOUT-915-G-LT+, HNTOUT-915-G, HNTOUT-915
Trade mark:	Nebra
FCC ID:	2AZDM--HNTOUT
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	01 Jun., 2021
Date of Test:	01 Jun., to 08 Jul., 2021
Date of report issued:	09 Jul., 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.

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: _____ ***Date:*** *09 Jul., 2021*

Test Engineer

Reviewed by: _____ ***Date:*** *09 Jul., 2021*

Project Engineer

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4 Test Summary

Test Items	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(3)	Pass*
6dB Emission Bandwidth	15.247 (a)(2)	Pass*
Power Spectral Density	15.247 (e)	Pass*
Band Edge	15.247(d)	Pass*
Conducted and radiated Spurious Emission	15.205/15.209	Pass

Remark:

1. *Pass: Meet the requirement.*
2. *Pass*: refer to the FCC ID: 2ARPP-GL5712UX.*
3. *N/A: Not Applicable for Non-adaptive equipment.*
4. *The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB (provided by the customer).*

Test Method:	*ANSI C63.4-2014* *ANSI C63.10-2013* *KDB 558074 D01 15.247 Meas Guidance v05r02*

5 General Information

5.1 Client Information

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

5.2 General Description of E.U.T.

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner
Model No.:	HNTOUT-915-G-LT+, HNTOUT-915-G-LT, HNTOUT-915-LT+, HNTOUT-915 –LT, HNTOUT-915-G-LT+, HNTOUT-915-G, HNTOUT-915
Operation Frequency:	923.3-927.5 MHz
Channel numbers:	8
Modulation technology:	Lora/FSK
Antenna Type:	External Antenna
Antenna gain:	3 dBi
Test Power supply:	AC 120V / 60Hz
Test Sample Condition:	The test samples were provided in good working order with no visible defects.
Remark:	Model No.: HNTOUT-915-G-LT+, HNTOUT-915-G-LT, HNTOUT-915-LT+, HNTOUT-915 –LT, HNTOUT-915-G-LT+, HNTOUT-915-G, HNTOUT-915 The difference: we will offer the unit with or without a GPS module included. Models with the GPS Included are indicated with a -G on the end of the model number. For example a unit with model no HNTOUT-915 is 915 Mhz, no GPS. A unit with Model No HNTOUT-915-G, is 915Mhz with GPS. We offer the unit using the Raspberry Pi Compute Module 3+ 32GB by standard (no suffix) but have an -LT variant which uses the Raspberry Pi Compute Module 3 Lite with a 32 GB eMMC to SD adapter card and a -LT+ variant which uses the Raspberry Pi Compute Module 3+ Lite with a 32 GB eMMC to SD adapter card. These suffixes can be applied to the models both with and without GPS as described above. We also provide customers the ability to, optionally, add both cellular connectivity and an additional 8 channel LoRa gateway to any of these models by using an mPCIe module however these come as optional extras.

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
0	923.3MHz	1	923.9MHz	2	924.5MHz
3	925.1MHz	4	925.7MHz	5	926.3MHz
6	926.9MHz	7	927.5MHz		
Note: the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test. Channel No. 0, 4 & 7 were selected as Lowest, Middle and Highest channel.					

5.3 Test environment and mode, and test samples plans

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Transmitting mode	Keep the EUT in continuous transmitting with modulation
The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) 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. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.	

5.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
MERCURY	Router	MW305R	1192FPW000074	N/A
Lenovo	PC	ThinkPad E450	0B95180	DoC

5.5 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)

5.6 Additions to, deviations, or exclusions from the method

No

5.7 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.

- **CNAS - Registration No.: CNAS L6048**

JianYan Testing Group Shenzhen 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

5.8 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

5.9 Test Instruments list

Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	966	01-19-2021	01-18-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-03-2021	03-02-2022
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-18-2020	06-17-2021
				06-17-2021	06-16-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-03-2021	03-02-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-18-2020	06-17-2021
				06-17-2021	06-16-2022
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2020	11-17-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-03-2021	03-02-2022
Pre-amplifier	CD	PAP-1G18	11804	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2020	11-17-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-18-2020	11-17-2021
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-03-2021	03-02-2022
Signal Generator	R&S	SMR20	1008100050	03-03-2021	03-02-2022
RF Switch Unit	MWRFTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTEST	MTS8200	Version: 2.0.0.0		
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-03-2021	03-02-2022
Cable	MICRO-COAX	MFR64639	K10742-5	03-03-2021	03-02-2022
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-03-2021	03-02-2022
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	09-25-2020	09-24-2021
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-01-2020	10-31-2021
Simulated Station	Rohde & Schwarz	CMW500	140493	07-22-2020	07-21-2021
10m SAC	ETS	RFSD-100-F/A	Q2005	03-31-2021	04-01-2024
BiConiLog Antenna	SCHWARZBECK	VULB 9168	1249	03-31-2021	04-01-2022
BiConiLog Antenna	SCHWARZBECK	VULB 9168	1250	03-31-2021	04-01-2022
EMI Test Receiver	R&S	ESR 3	102800	04-06-2021	04-07-2022
EMI Test Receiver	R&S	ESR 3	102802	04-06-2021	04-07-2022
Pre-amplifier	Bost	LNA 0920N	2016	04-06-2021	04-07-2022
Pre-amplifier	Bost	LNA 0920N	2019	04-06-2021	04-07-2022
Test Software	R&S	EMC32	Version: 10.50.40		

Conducted Emission:

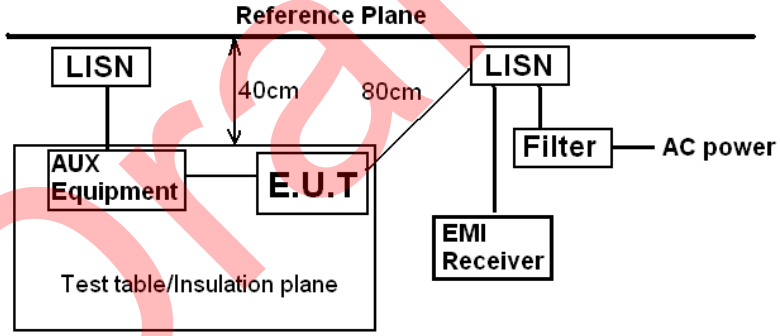
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-03-2021	03-02-2022
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-03-2021	03-02-2022
LISN	CHASE	MN2050D	1447	03-03-2021	03-02-2022
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	06-18-2020	06-17-2022
Cable	HP	10503A	N/A	03-03-2021	03-02-2022
EMI Test Software	AUDIX	E3	Version: 6.110919b		

6 Test results and Measurement Data

6.1 Antenna requirement:

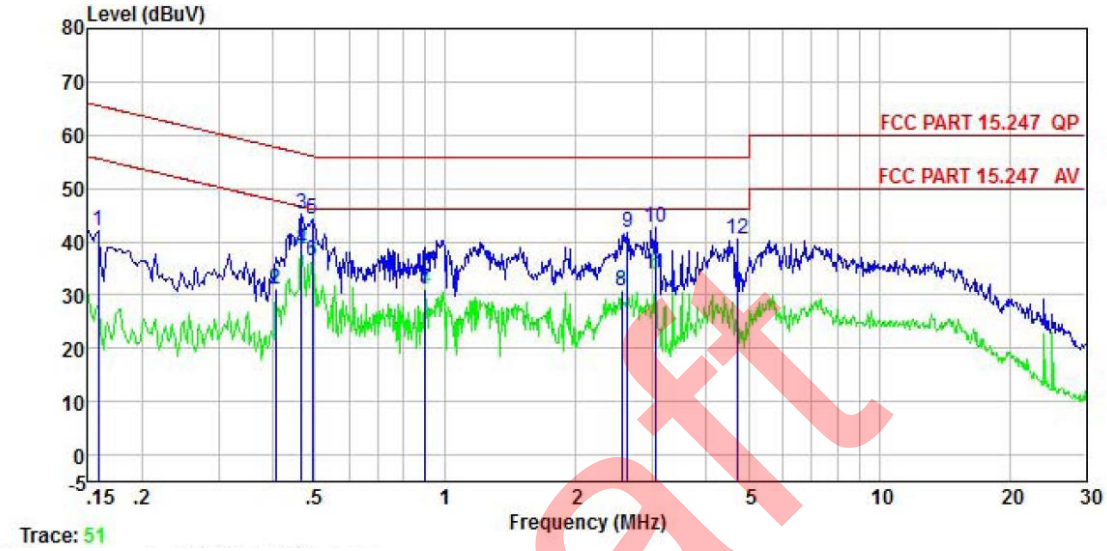
Standard requirement:	FCC Part 15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The BLE antenna is an External antenna which cannot replace by end-user, the best-case gain of the antenna is 3 dBi.	

6.2 Conducted Emission

Test Requirement:	FCC Part 15 C Section 15.207		
Test Frequency Range:	150 kHz to 30 MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	* Decreases with the logarithm of the frequency.		
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.), which provides 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 refer 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 setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*		
Test Instruments:	Refer to section 5.9 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Passed		

Measurement Data:

Product name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product model:	HNTOUT-915-G-LT+
Test by:	Carey	Test mode:	Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Huni: 55%

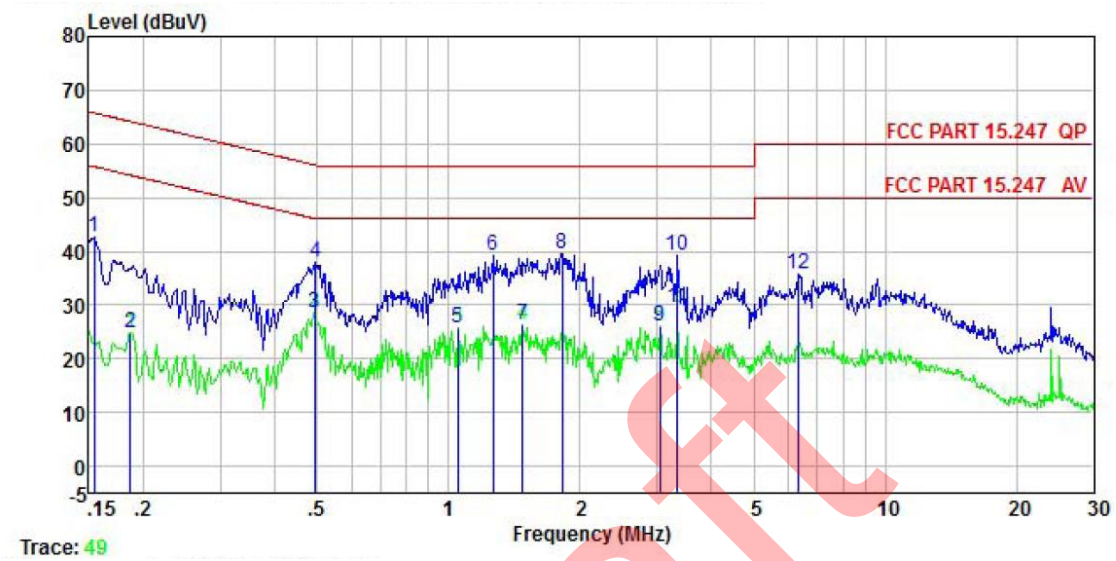


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.158	31.92	10.12	-0.07	0.01	41.98	65.56	-23.58	QP
2	0.406	20.43	10.29	0.36	0.04	31.12	47.73	-16.61	Average
3	0.466	35.09	10.32	-0.12	0.03	45.32	56.58	-11.26	QP
4	0.466	28.38	10.32	-0.12	0.03	38.61	46.58	-7.97	Average
5	0.494	34.22	10.34	-0.32	0.03	44.27	56.10	-11.83	QP
6	0.494	26.51	10.34	-0.32	0.03	36.56	46.10	-9.54	Average
7	0.899	20.31	10.46	0.21	0.04	31.02	46.00	-14.98	Average
8	2.554	20.36	10.56	-0.25	0.13	30.80	46.00	-15.20	Average
9	2.636	31.40	10.57	-0.25	0.11	41.83	56.00	-14.17	QP
10	3.041	32.21	10.58	-0.20	0.07	42.66	56.00	-13.34	QP
11	3.041	23.34	10.58	-0.20	0.07	33.79	46.00	-12.21	Average
12	4.696	29.80	10.65	0.04	0.09	40.58	56.00	-15.42	QP

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 + Cable Loss.*

Product name:		Product model:	
Test by:	Carey	Test mode:	Tx 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	0.154	32.68	9.89	0.01	0.01	42.59	65.78	-23.19	QP
2	0.186	14.87	9.91	0.00	0.02	24.80	54.20	-29.40	Average
3	0.494	18.41	10.20	0.03	0.03	28.67	46.10	-17.43	Average
4	0.497	27.75	10.20	0.03	0.03	38.01	56.05	-18.04	QP
5	1.049	14.90	10.58	0.09	0.06	25.63	46.00	-20.37	Average
6	1.262	28.26	10.64	0.11	0.10	39.11	56.00	-16.89	QP
7	1.480	15.51	10.70	0.13	0.14	26.48	46.00	-19.52	Average
8	1.819	28.57	10.77	0.16	0.19	39.69	56.00	-16.31	QP
9	3.041	14.85	10.90	0.32	0.07	26.14	46.00	-19.86	Average
10	3.346	27.78	10.92	0.39	0.07	39.16	56.00	-16.84	QP
11	3.346	18.06	10.92	0.39	0.07	29.44	46.00	-16.56	Average
12	6.319	23.68	11.07	0.79	0.09	35.63	60.00	-24.37	QP

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 + Cable Loss.*

6.3 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(3)
Limit:	30dBm
Test setup:	**Refer to the FCC ID: 2ARPP-GL5712UX**
Test Instruments:	
Test mode:	
Measurement Data:	
Test results:	Passed

6.4 Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(2)
Limit:	>500kHz
Test setup:	**Refer to the FCC ID: 2ARPP-GL5712UX**
Test Instruments:	
Test mode:	
Measurement Data:	
Test results:	Passed

6.5 Power Spectral Density

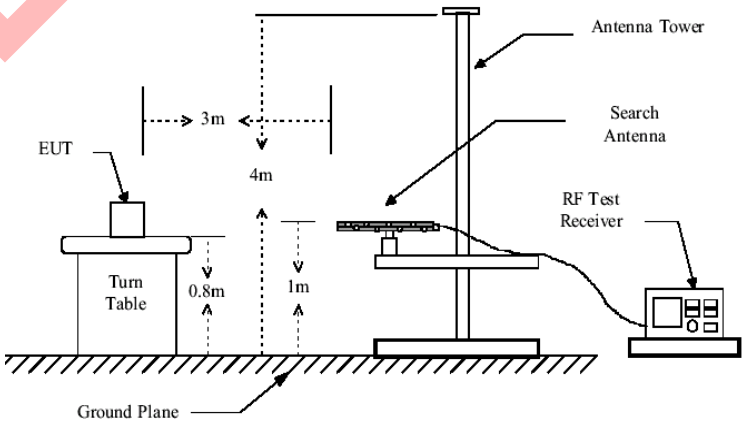
Test Requirement:	FCC Part 15 C Section 15.247 (e)
Limit:	8 dBm/3kHz
Test setup:	**Refer to the FCC ID: 2ARPP-GL5712UX**
Test Instruments:	
Test mode:	
Measurement Data:	
Test results:	Passed

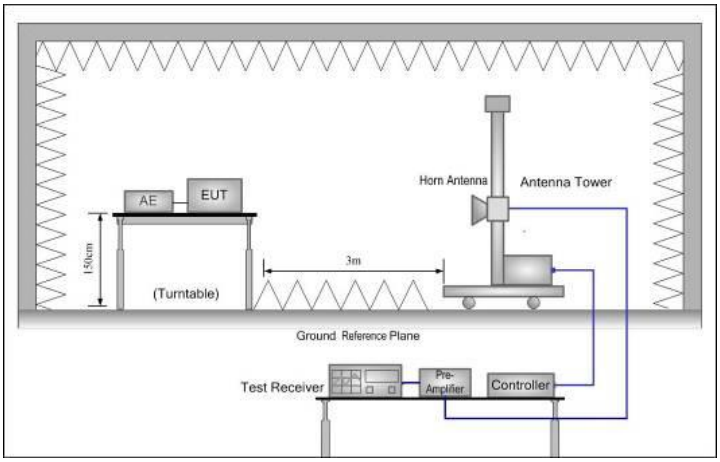
6.6 Band Edge

6.6.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	**Refer to the FCC ID: 2ARPP-GL5712UX**
Test Instruments:	
Test mode:	
Measurement Data:	
Test results:	Passed

6.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Frequency Range:	960MHz to 1.240GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	960MHz-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
	960MHz-1GHz	54.00			Quasi-peak Value
	Above 1GHz	54.00			Average Value
		74.00			Peak Value
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. 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 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 setup:	Below 1GHz  Above 1GHz				

	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Below 1GHz:

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	**Product Model:**	HNTOUT-915-G-LT+
Test By:	Carey	**Test mode:**	Tx mode
Test Channel:	Highest channel	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

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:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	**Product Model:**	HNTOUT-915-G-LT+
Test By:	Carey	**Test mode:**	Tx mode
Test Channel:	Highest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

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:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	**Product Model:**	HNTOUT-915-G-LT+
Test By:	Carey	**Test mode:**	Tx mode
Test Channel:	Highest channel	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

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:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	**Product Model:**	HNTOUT-915-G-LT+
Test By:	Carey	**Test mode:**	Tx mode
Test Channel:	Highest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

Remark:

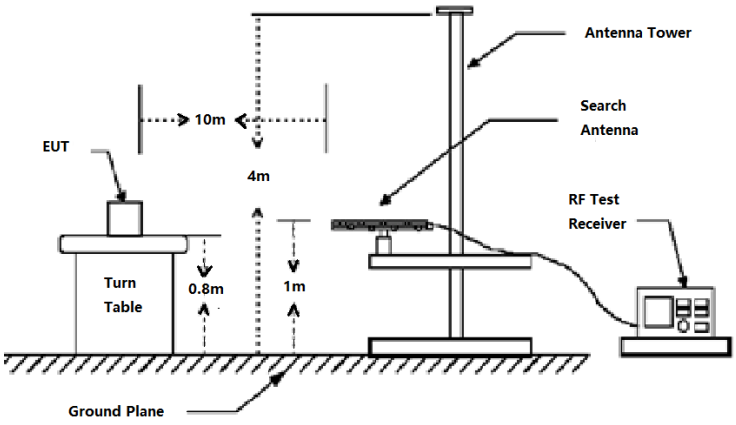
1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

6.7 Spurious Emission

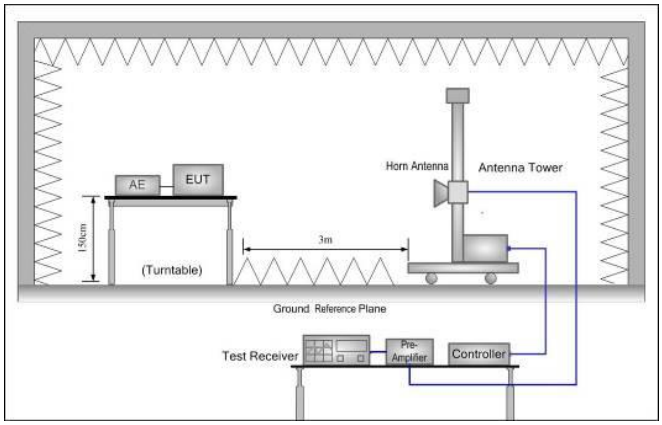
6.7.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	**Refer to the FCC ID: 2ARPP-GL5712UX**
Test Instruments:	
Test mode:	
Measurement Data:	
Test results:	Passed

6.7.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td colspan="5">FCC Part 15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="5">9kHz to 25GHz</td></tr>
<tr><td>Test Distance:</td><td colspan="5">3m</td></tr>
<tr><td>Receiver setup:</td><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td></td><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td></td><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td></td><td>RMS</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
<tr><td>Limit:</td><td colspan="2">Frequency</td><td colspan="2">Limit (dBuV/m @10m)</td><td>Remark</td></tr>
<tr><td></td><td colspan="2">30MHz-88MHz</td><td colspan="2">30.0</td><td>Quasi-peak Value</td></tr>
<tr><td></td><td colspan="2">88MHz-216MHz</td><td colspan="2">33.5</td><td>Quasi-peak Value</td></tr>
<tr><td></td><td colspan="2">216MHz-960MHz</td><td colspan="2">36.0</td><td>Quasi-peak Value</td></tr>
<tr><td></td><td colspan="2">960MHz-1GHz</td><td colspan="2">44.0</td><td>Quasi-peak Value</td></tr>
<tr><td></td><td colspan="2" rowspan="2">Above 1GHz</td><td colspan="2">54.0</td><td>Average Value</td></tr>
<tr><td></td><td colspan="2">74.0</td><td>Peak Value</td></tr>
<tr><td>Test Procedure:</td><td colspan="5">1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 3 meter 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 rota 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 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</td></tr>
<tr><td>Test setup:</td><td colspan="5">Below 1GHz
 

Above 1GHz</td></tr>
</table>

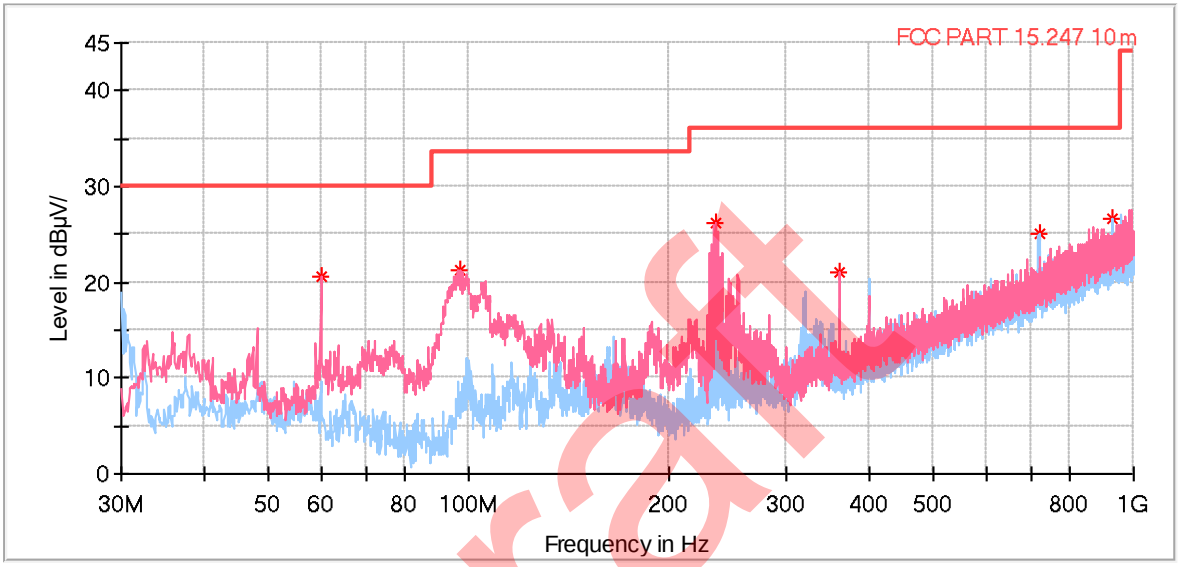
	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30MHz is too low, so only shows the data of above 30MHz in this report.

Measurement Data (worst case):

Below 1GHz:

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product Model:	HNTOUT-915-G-LT+
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%

Full Spectrum



Frequency (MHz)	Quasi-peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
59.973000	20.60	30.00	9.40	100.0	V	56.0	-16.3
97.318000	21.35	33.50	12.15	100.0	V	104.0	-19.2
235.252000	26.28	36.00	9.72	100.0	V	3.0	-16.0
359.994000	21.04	36.00	14.96	100.0	V	68.0	-12.5
720.058000	25.18	36.00	10.82	100.0	H	80.0	-4.7
931.033000	26.75	36.00	9.25	100.0	H	33.0	-0.9

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.*

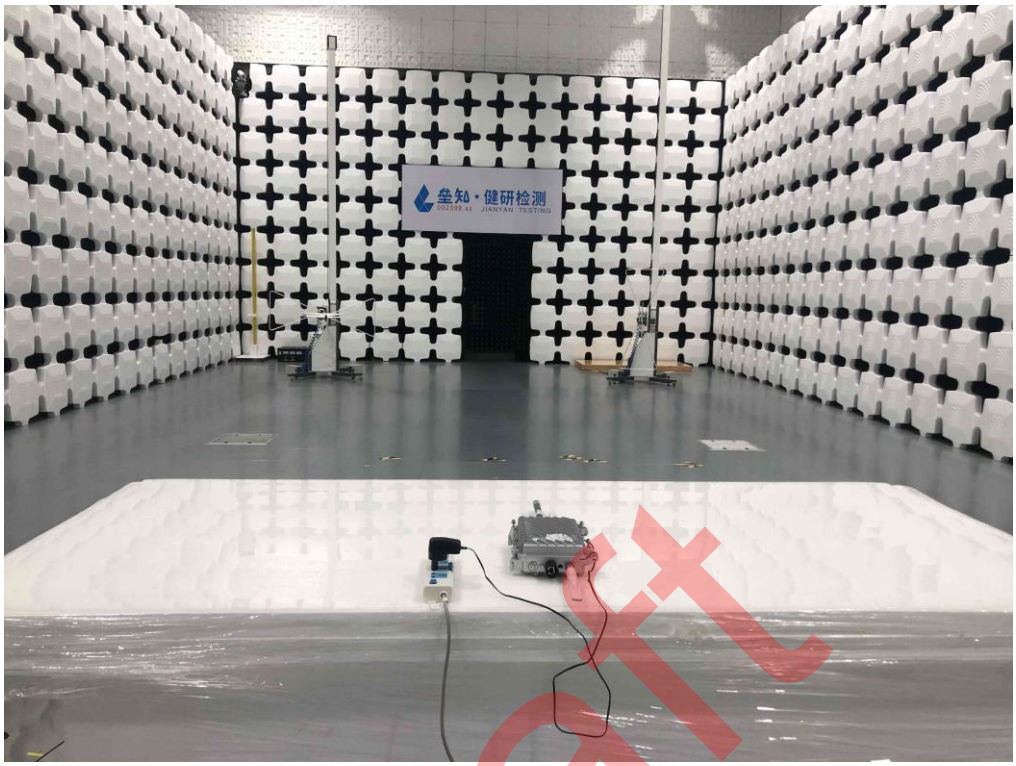
Above 1GHz:

Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1846.60	67.56	-20.77	46.79	74.00	27.21	Vertical
1846.60	74.00	-20.77	53.23	74.00	20.77	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1846.60	65.08	-20.77	44.31	54.00	9.69	Vertical
1846.60	72.92	-20.77	52.15	54.00	1.85	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1851.40	67.42	-20.75	46.67	74.00	27.33	Vertical
1851.40	74.39	-20.75	53.64	74.00	20.36	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1851.40	64.78	-20.75	44.03	54.00	9.97	Vertical
1851.40	73.09	-20.75	52.34	54.00	1.66	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1855.00	67.22	-20.73	46.49	74.00	27.51	Vertical
1855.00	74.09	-20.73	53.36	74.00	20.64	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1855.00	64.73	-20.73	44.00	54.00	10.00	Vertical
1855.00	73.05	-20.73	52.32	54.00	1.68	Horizontal

7 Test Setup Photo

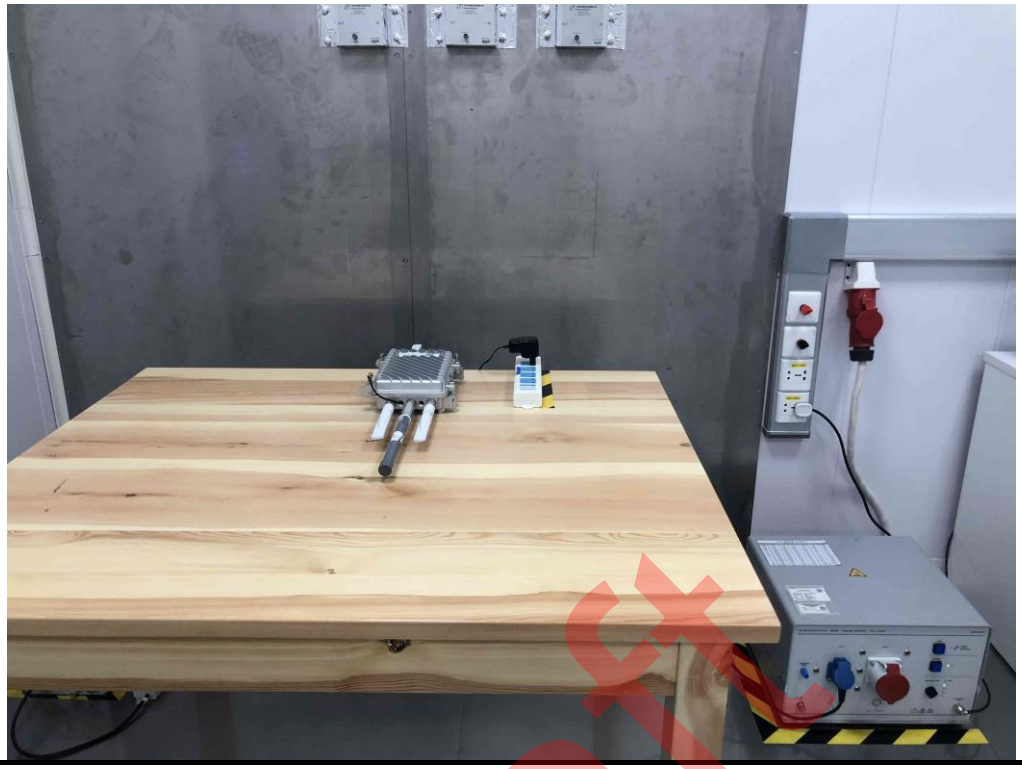
Radiated Spurious Emission

Below 1GHz



Above 1GHz

Conducted Emission



8 EUT Constructional Details

Reference to the test report No.: JYTSZB-R12-2100992

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