

EMC REPORT

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 Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner

Model No.: HNTIN-470-G, HNTIN-868-G, HNTIN-915-G, HNTIN-433-G, HNTIN-470, HNTIN-868, HNTIN-915, HNTIN-433

Applicable standards:
ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-3 V2.1.1 (2019-03)
ETSI EN 301 489-17 V3.2.4 (2020-09)
ETSI EN 301 489-19 V2.1.1 (2019-04)

Date of sample receipt: 12 Mar., 2021

Date of Test: 13 Mar., to 19 Apr., 2021

Date of report issue: 23 Apr., 2021

Test Result: PASS*

*In the configuration tested, the EUT complied with the standards specified above.

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 electromagnetic compatibility contained in Directive 2014/53/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.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

2 Version

| Version No. | Date | Description |
|-------------|---------------|-------------|
| 00 | 23 Apr., 2021 | Original |
| | | |
| | | |
| | | |
| | | |

Tested by: Yanyo Wu
Test Engineer

Date: 23 Apr., 2021

Reviewed by: Winner Zhang
Project Engineer

Date: 23 Apr., 2021

3 Contents

| | Page |
|-----------------------------------------------------------------|-----------|
| 1 COVER PAGE..... | 1 |
| 2 VERSION..... | 2 |
| 3 CONTENTS..... | 3 |
| 4 TEST SUMMARY..... | 4 |
| 5 GENERAL INFORMATION..... | 5 |
| 5.1 CLIENT INFORMATION | 5 |
| 5.2 GENERAL DESCRIPTION OF E.U.T..... | 5 |
| 5.3 TEST MODE AND TEST SAMPLES PLANS | 6 |
| 5.4 DESCRIPTION OF SUPPORT UNITS..... | 6 |
| 5.5 MEASUREMENT UNCERTAINTY | 6 |
| 5.6 DESCRIPTION OF CABLE USED..... | 6 |
| 5.7 LABORATORY FACILITY | 6 |
| 5.8 LABORATORY LOCATION | 6 |
| 5.9 MONITORING OF EUT FOR THE IMMUNITY TEST..... | 6 |
| 5.10 TEST INSTRUMENTS LIST..... | 7 |
| 6 EMC REQUIREMENTS SPECIFICATION IN ETSI EN 301489 | 9 |
| 6.1 EMI (EMISSION) | 9 |
| 6.1.1 Radiated Emission | 9 |
| 6.1.2 Conducted Emissions..... | 15 |
| 6.1.3 Harmonics Test Results | 19 |
| 6.1.4 Flicker Test Results | 19 |
| 6.2 EMS (IMMUNITY) | 20 |
| 6.2.1 Electrostatic Discharge..... | 23 |
| 6.2.2 RadiatedImmunity | 27 |
| 6.2.3 Electrical Fast Transients..... | 30 |
| 6.2.4 Surge..... | 32 |
| 6.2.5 Injected Currents susceptibility Test..... | 33 |
| 6.2.6 Voltage Dip and Voltage Interruptions | 35 |
| 7 TEST SETUP PHOTO | 36 |
| 8 EUT CONSTRUCTIONAL DETAILS | 42 |

4 Test Summary

| Test Item | Test Requirement | Test Method | Application | Result |
|----------------------------------|------------------|---------------|-------------|--------------|
| EMI Test Items | | | | |
| Radiated Emission | ETSI EN301 489-1 | EN 55032 | Enclosure | PASS |
| Conducted Emission | ETSI EN301 489-1 | EN 55032 | AC port | PASS |
| Harmonic Current Emissions | ETSI EN301 489-1 | EN 61000-3-2 | AC port | Not Required |
| Voltage Fluctuations and Flicker | ETSI EN301 489-1 | EN 61000-3-3 | AC port | Not Required |
| EMS Test Items | | | | |
| ESD (Electrostatic Discharge) | ETSI EN301 489-1 | EN 61000-4-2 | Enclosure | PASS |
| Radiated Immunity | ETSI EN301 489-1 | EN 61000-4-3 | Enclosure | PASS |
| EFT (Electrical Fast Transients) | ETSI EN301 489-1 | EN 61000-4-4 | AC port | PASS |
| Surge Immunity | ETSI EN301 489-1 | EN 61000-4-5 | AC port | PASS |
| Injected Currents | ETSI EN301 489-1 | EN 61000-4-6 | AC port | PASS |
| Voltage Dips and Interruptions | ETSI EN301 489-1 | EN 61000-4-11 | AC port | PASS |
| Remark: | | | | |
| 1. Pass: Meet the requirement. | | | | |
| 2. N/A: Not Applicable. | | | | |

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 Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | | |
| Model No.: | HNTIN-470-G, HNTIN-868-G, HNTIN-915-G, HNTIN-433-G, HNTIN-470, HNTIN-868, HNTIN-915, HNTIN-433 | | |
| Tx Frequency: | Wi-Fi: 2412MHz~2472MHz | LoRa: 868.1MHz~868.5MHz | |
| | Bluetooth/ BLE: 2402MHz~2480MHz | | |
| Rx Frequency: | Wi-Fi: 2412MHz~2472MHz | LoRa: 868.1MHz~868.5MHz | |
| | Bluetooth/ BLE: 2402MHz~2480MHz | GPS: 1575.42MHz | |
| Hardware version: | V12-15-2020-1614 | | |
| Software version: | a98bfc8 | | |
| Modulation technology: | Wi-Fi: | <input checked="" type="checkbox"/> 802.11b(DSSS) | <input checked="" type="checkbox"/> 802.11g/n20/n40 (OFDM) |
| | Bluetooth: | <input checked="" type="checkbox"/> BDR(GFSK) | <input checked="" type="checkbox"/> EDR($\pi/4$ -DQPSK, 8DPSK) <input checked="" type="checkbox"/> LE(GFSK) |
| | LoRa | <input checked="" type="checkbox"/> OOK | |
| Antenna Type: | Wi-Fi/ Bluetooth/ BLE/ GPS: Internal Antenna LoRa: Cylindrical Antenna | | |
| Antenna Gain: | Wi-Fi: 2.0dBi | Bluetooth/ BLE: 2.0dBi | |
| | LoRa: 3.0dBi | GPS: 24dBi | |
| Power supply: | DC 12V | | |
| AC adapter: | Model: TM-K018VP-01201500PE-Z Input: 100-240V~50/60Hz 0.45A Output: 12.0V, 1.5A | | |
| Remark: | Model No.: HNTIN-470-G, HNTIN-868-G, HNTIN-915-G, HNTIN-433-G, HNTIN-470, HNTIN-868, HNTIN-915, HNTIN-433 has the same internal circuit design, layout, components and internal wiring. The difference is that the ones with the -G suffix have GPS function, while those without the suffix do not. Each model has two appearances, except for the appearance, the interior is exactly the same. In addition, the corresponding frequency of each model of LoRa module is different, as follows: The Nebra HNT Indoor Hotspot is available in 4 variants to support multiple regions. It is available in the following frequency variants: <ul style="list-style-type: none">• 433 MHz (HNTIN-433)• 470 MHz (HNTIN-470)• 868 MHz (HNTIN-868)• 915 MHz (HNTIN-915) | | |

5.3 Test mode and test samples plans

| Radiated emission | |
|------------------------------------------------------------------------------|-------------------------------------------------------|
| TM 1: Wi-Fi link(2.4G Wi-Fi +Bluetooth link + GPS link + LoRa link + Adapter | |
| Remark: | The report only reflects the test data of worst mode. |

5.4 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 |
| DELL | PC | OPTIPLEX7070 | 2J8XSZ2 | DoC |
| DELL | MONITOR | SE2018HR | 3M7QPY2 | DoC |
| DELL | KEYBOARD | KB216d | N/A | DoC |
| DELL | MOUSE | MS116t1 | N/A | DoC |
| HP | Printer | HP LaserJet P1007 | VNFP409729 | DoC |
| Anritsu | Simulated Station | MT8820C | 6201026545 | N/A |
| Simulated Station | Rohde& Schwarz | CMU200 | 122477 | N/A |

5.5 Measurement Uncertainty

| Parameter | Expanded Uncertainty (Confidence of 95%) |
|-------------------------------------|------------------------------------------|
| Conducted Emission (9kHz ~ 30MHz) | ±1.60 dB |
| Radiated Emission (9kHz ~ 30MHz) | ±3.12 dB |
| Radiated Emission (30MHz ~ 1000MHz) | ±4.32 dB |
| Radiated Emission (1GHz ~ 18GHz) | ±5.16 dB |
| Radiated Emission (18GHz ~ 26.5GHz) | ±3.20 dB |

5.6 Description of Cable Used

N/A

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.

- **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 17025:2005General 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@ccis-cb.com, Website: <http://www.ccis-cb.com>

5.9 Monitoring of EUT for the Immunity Test

| | |
|---------|--------------------------------|
| Visual: | Monitored the display of EUT |
| Sound: | Monitored the sound of EUT |
| Other: | Monitored the data link of EUT |

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 | ETS | 9m*6m*6m | 966 | 01-19-2021 | 01-18-2024 |
| BiConiLog Antenna | SCHWARZBECK | VULB9163 | 497 | 03-03-2021 | 03-02-2022 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 916 | 03-03-2021 | 03-02-2022 |
| EMI Test Software | AUDIX | E3 | Version: 6.110919b | | |
| Pre-amplifier | HP | 8447D | 2944A09358 | 03-03-2021 | 03-02-2022 |
| Pre-amplifier | CD | TRLA-010180G50B | 20120401 | 03-03-2021 | 03-02-2022 |
| Spectrum analyzer | Rohde & Schwarz | FSP30 | 101454 | 03-03-2021 | 03-02-2022 |
| EMI Test Receiver | Rohde & Schwarz | ESRP7 | 101070 | 03-03-2021 | 03-02-2022 |
| Simulated Station | Anritsu | MT8820C | 6201026545 | 03-03-2021 | 03-02-2022 |
| 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 |

| 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 3 | 101189 | 03-03-2021 | 03-02-2022 |
| RF Switch | TOP PRECISION | RSU0301 | N/A | 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 | 06-17-2021 |
| ISN | Schwarzbeck | CAT3 8158 | #96 | 03-03-2021 | 03-02-2022 |
| ISN | Schwarzbeck | CAT5 8158 | #166 | 03-03-2021 | 03-02-2022 |
| ISN | Schwarzbeck | NTFM 8158 | #126 | 03-03-2021 | 03-02-2022 |
| Cable | HP | 10503A | N/A | 03-03-2021 | 03-02-2022 |
| EMI Test Software | AUDIX | E3 | Version: 6.110919b | | |

| ESD: | | | | | |
|----------------|--------------|-----------|------------|------------------------|----------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| ESD Simulator | Haefely | ONYX30 | 183900 | 03-03-2021 | 03-02-2022 |

| Conducted Immunity: | | | | | |
|-----------------------------------|-----------------|------------|---------------|-------------------------|-----------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| Conducted Disturbance Test system | SCHLODER | CDG6000 | 126B1445/2016 | 03-03-2021 | 03-02-2022 |
| Coupling/Decoupling Network | SCHLODER | CDN-M2+3 | A2210417/2016 | 03-03-2021 | 03-02-2022 |
| EM Clamp | SCHLODER | EMCL-20 | 132A1281/2016 | 03-03-2021 | 03-02-2022 |
| Coupling/Decoupling Network | SCHLODER | CDN M5-32A | 10204-1 | 02-02-2021 | 02-01-2022 |
| Nexus Conduituining Amplifier | B&K | 2690-0S2 | 3003552 | N/A | N/A |
| MUTH Simulator | B&K | 4227 | N/A | N/A | N/A |
| Sound Level Calibrator | B&K | 4231 | N/A | N/A | N/A |
| Audio Analyzer | Rohde & Schwarz | UPL 16 | 100150 | 03-03-2021 | 03-02-2022 |

| Surge \ EFT \ V-dips \ RW : | | | | | |
|------------------------------------------------------------------------------------|--------------|-----------------------------------|-------------|---------------------|-------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| Four-in-one Immunity test system | EMC PARTNER | IMU-MGE | 109937-1520 | 01-30-2021 | 01-29-2022 |
| Lightning test system module | EMC PARTNER | EXT-IMU3000S6 (Surge1.2/50us) | 1652 | 01-30-2021 | 01-29-2022 |
| Lightning surge high speed communication line coupling network 8 lines (Surge, RW) | EMC PARTNER | CDN-UTP8 ED3 | 1594 | 01-30-2021 | 01-29-2022 |
| Lightning test module of telecommunication terminal | EMC PARTNER | EXT-IMU3000 T6 (Surge 10/700 μ s) | 1568 | 01-30-2021 | 01-29-2022 |
| Coupling decoupling network of power line (Surge, EFT, RW) | EMC PARTNER | CDN-A-6-32 | 109037-3063 | 01-30-2021 | 01-29-2022 |
| EFT test system module | EMC PARTNER | EXT-IMU3000F5 | 1626 | 01-30-2021 | 01-29-2022 |
| Capacitive coupling clamp EFT | EMC PARTNER | CN-EFT1000/VERI-CP-EFT | 1863/1635 | 01-30-2021 | 01-29-2022 |
| Voltage dips and Interruption test module | EMC PARTNER | EXT-IMU D | 1723 | 01-30-2021 | 01-29-2022 |
| Ring wave test module | EMC PARTNER | EXT-IMU3000 R6 | 1567 | 01-30-2021 | 01-29-2022 |

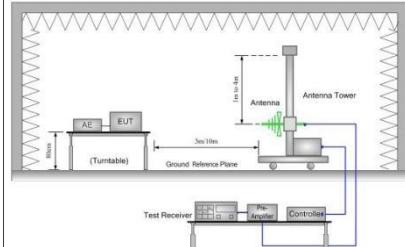
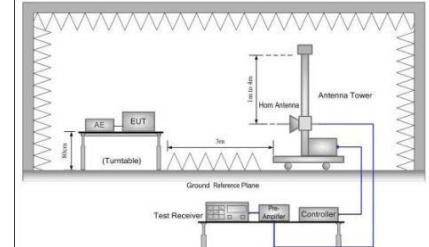
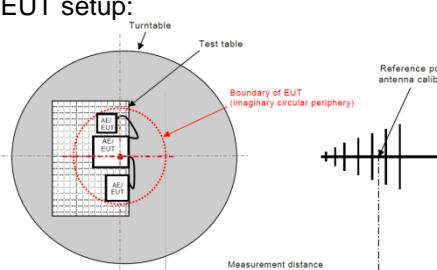
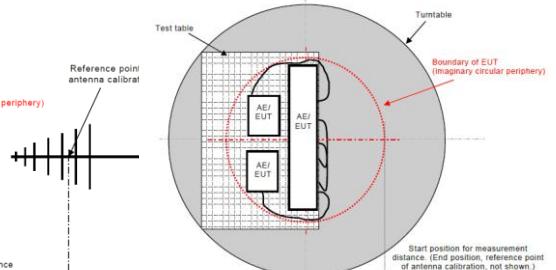
| Radiated Immunity: | | | | | |
|------------------------------|--------------------|--------------|--------------|----------------------|--------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| Signal Generator | Rohde & Schwarz | SMR20 | 1104.002.20 | 03-03-2021 | 03-02-2022 |
| RF Amplifier 80M-1GHz | Amplifier Research | AR 150W1000 | 115243 | 03-03-2021 | 03-02-2022 |
| RF Amplifier 1GHz-4.2GHz | Amplifier Research | AR 25S1G4AM1 | 145863 | 03-03-2021 | 03-02-2022 |
| RF Amplifier 4GHz-6GHz | Amplifier Research | 35S4G8A | 247443 | 03-03-2021 | 03-02-2022 |
| Power Meter | Rohde & Schwarz | NRVS | 1020.1809.02 | 03-03-2021 | 03-02-2022 |
| Software EMC32 | Rohde & Schwarz | EMC32-S | N/A | N/A | N/A |
| Log-periodic Antenna | Amplifier Research | AT1080 | 3654 | 03-03-2021 | 03-02-2022 |
| Antenna Tripod | Amplifier Research | TP1000A | 7412 | N/A | N/A |
| High Gain Horn Antenna | Amplifier Research | AT4002A | 6987 | 03-03-2021 | 03-02-2022 |
| Nexus Conduutuning Amplifier | B&K | 2690 | 3003552 | N/A | N/A |
| MUTH Simulator | B&K | 4227 | N/A | N/A | N/A |
| Sound Level Calibrator | B&K | 4231 | N/A | N/A | N/A |
| Audio Analyzer | Rohde & Schwarz | UPL 16 | 100150 | 03-03-2021 | 03-02-2022 |

| Harmonic Current/ Voltage Fluctuation and Flicker: | | | | | |
|----------------------------------------------------|--------------|-----------|------------|----------------------|--------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| Three phase harmonic scintillation analyzer | AMETEK | PACS-3 | 2046A02916 | 02-03-2021 | 02-02-2022 |
| Three phase harmonic power supply | AMETEK | MX45 | 2046A00586 | 02-03-2021 | 02-02-2022 |

6 EMC Requirements Specification in ETSI EN 301489

6.1 EMI (Emission)

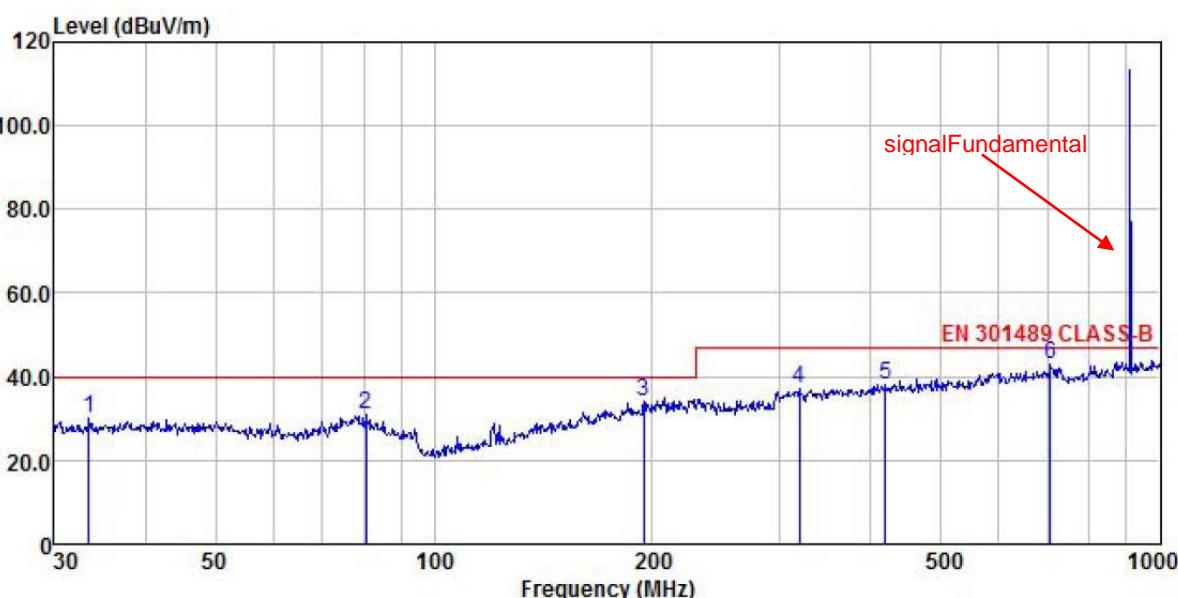
6.1.1 Radiated Emission

| | | | | | | | | | |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------|----------|----------|--|--|--|--|
| Test Requirement: | ETSI EN301 489-1 | | | | | | | | |
| Test Method: | EN55032 | | | | | | | | |
| Test Frequency Range: | 30MHz to 6GHz | | | | | | | | |
| Test Distance: | 3m | | | | | | | | |
| Receiver setup: | Frequency | Detector | RBW | VBW | Remark | | | | |
| | 30MHz-1GHz | Quasi-peak | 120kHz | 300kHz | QP Value | | | | |
| | Above 1GHz | Peak | 1MHz | 3MHz | PK Value | | | | |
| | | Average | 1MHz | 3MHz | AV Value | | | | |
| Limit: | Frequency | Limit (dBuV/m @ 3m) | | Remark | | | | | |
| | 30MHz-230MHz | 40.0 | | QP Value | | | | | |
| | 230MHz-1GHz | 47.0 | | QP Value | | | | | |
| | 1GHz-3GHz | 50.0 | | AV Value | | | | | |
| | | 70.0 | | PK Value | | | | | |
| | 3GHz-6GHz | 54.0 | | AV Value | | | | | |
| | | 74.0 | | PK Value | | | | | |
| Test setup: | Below 1GHz: | | | | | | | | |
| |  | | | | | | | | |
| |  | | | | | | | | |
| | Above 1GHz: | | | | | | | | |
| EUT setup: |  | | | | | | | | |
| |  | | | | | | | | |
| Test Procedure: | 30MHz to 1GHz: | | | | | | | | |
| | <ol style="list-style-type: none"> The radiated emissions test was conducted in a semi-anechoic chamber. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. <p>Measurements were performed for both horizontal and vertical</p> | | | | | | | | |

| | |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>antenna polarization.</p> <p>Above 1GHz:</p> <ol style="list-style-type: none">1. The radiated emissions test was conducted in a fully-anechoic chamber.2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emission spectrum plots of the EUT.4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization. |
| Test Instruments: | Refer to section 5.10 for details |
| Testmode: | Refer to section 5.3 for details |
| Test results: | Passed |

Measurement Data:**Below 1GHz:**

| | | | |
|------------------------|------------------------------------------------------------------|-----------------------|----------------------|
| Product Name: | Nebra Smart Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | Product Model: | HNTIN-868-G |
| Test By: | Yaro | Test mode: | TM 1 |
| Test Frequency: | 30 MHz ~ 1 GHz | Polarization: | Vertical |
| Test Voltage: | AC 230/50Hz | Environment: | Temp: 24°C Huni: 57% |

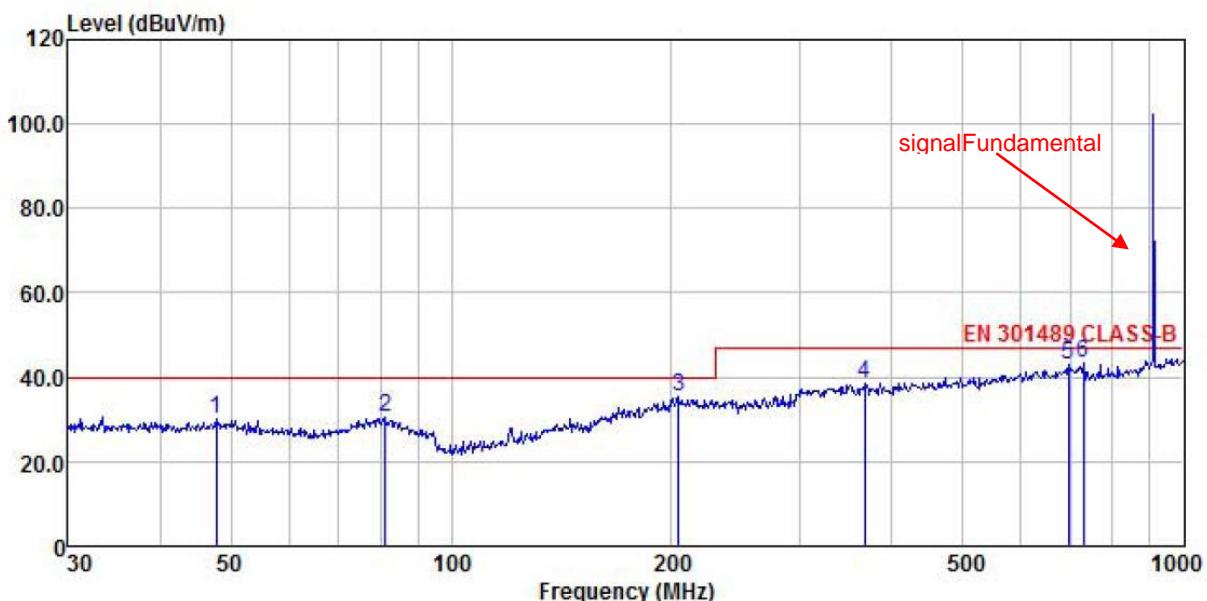


| Freq MHz | Read Level dBuV | Antenna Factor dB/m | Cable Loss dB | Preamp Factor dB | Limit Line dBuV/m | Over Line dBuV/m | Over Limit dB | Remark |
|-------------|-----------------------|---------------------------|---------------------|------------------------|-------------------------|------------------------|---------------------|--------|
| | | | | | | | | |
| 1 33.445 | 17.51 | 12.36 | 0.38 | 0.00 | 30.25 | 40.00 | -9.75 QP | |
| 2 80.644 | 17.50 | 12.66 | 0.69 | 0.00 | 30.85 | 40.00 | -9.15 QP | |
| 3 194.453 | 14.90 | 17.75 | 1.39 | 0.00 | 34.04 | 40.00 | -5.96 QP | |
| 4 318.817 | 16.66 | 18.74 | 1.81 | 0.00 | 37.21 | 47.00 | -9.79 QP | |
| 5 419.108 | 16.87 | 19.14 | 2.09 | 0.00 | 38.10 | 47.00 | -8.90 QP | |
| 6 706.700 | 19.46 | 20.51 | 2.85 | 0.00 | 42.82 | 47.00 | -4.18 QP | |

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.
3. The Aux Factor is a notch filter switch box loss, this item is not used.

| | | | |
|------------------------|------------------------------------------------------------------|-----------------------|----------------------|
| Product Name: | Nebra Smart Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | Product Model: | HNTIN-868-G |
| Test By: | Yaro | Test mode: | TM 1 |
| Test Frequency: | 30 MHz ~ 1 GHz | Polarization: | Horizontal |
| Test Voltage: | AC 230/50Hz | Environment: | Temp: 24°C Huni: 57% |



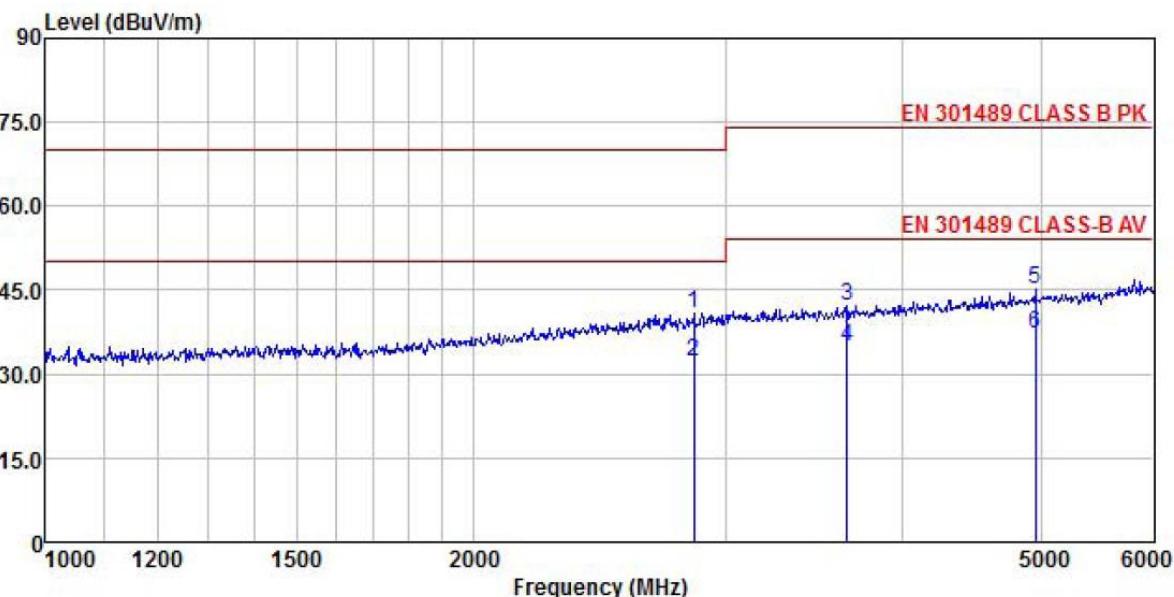
| Freq | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Remark |
|------|-------------------|----------------|------------|---------------|--------|------------|------------|----------|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 47.826 | 16.47 | 13.07 | 0.48 | 0.00 | 30.02 | 40.00 | -9.98 QP |
| 2 | 81.212 | 17.27 | 12.52 | 0.69 | 0.00 | 30.48 | 40.00 | -9.52 QP |
| 3 | 204.238 | 15.45 | 18.32 | 1.44 | 0.00 | 35.21 | 40.00 | -4.79 QP |
| 4 | 366.823 | 17.78 | 18.90 | 1.94 | 0.00 | 38.62 | 47.00 | -8.38 QP |
| 5 | 696.857 | 19.72 | 20.48 | 2.82 | 0.00 | 43.02 | 47.00 | -3.98 QP |
| 6 | 729.358 | 20.02 | 20.56 | 2.93 | 0.00 | 43.51 | 47.00 | -3.49 QP |

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.
3. The Aux Factor is a notch filter switch box loss, this item is not used.

Above 1GHz:

| | | | |
|------------------------|------------------------------------------------------------------|-----------------------|----------------------|
| Product Name: | Nebra Smart Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | Product Model: | HNTIN-868-G |
| Test By: | Yaro | Test mode: | TM 1 |
| Test Frequency: | 1 GHz ~ 6 GHz | Polarization: | Vertical |
| Test Voltage: | AC 230/50Hz | Environment: | Temp: 24°C Huni: 57% |

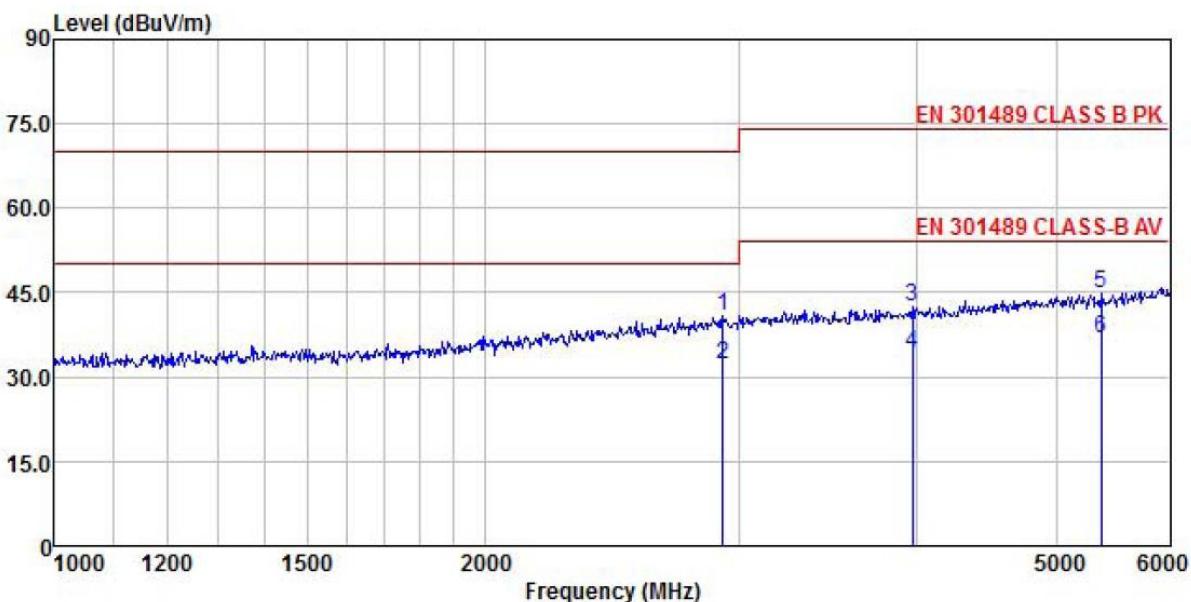


| Freq MHz | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Limit Line | Over Line | Over Limit | Remark |
|-------------|---------------|-------------------|---------------|------------------|---------------|--------------|---------------|---------|
| | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 2852.453 | 58.99 | 28.10 | 8.37 | 54.57 | 40.89 | 70.00 | -29.11 | Peak |
| 2 2852.453 | 50.16 | 28.10 | 8.37 | 54.57 | 32.06 | 50.00 | -17.94 | Average |
| 3 3652.610 | 58.40 | 28.89 | 9.39 | 54.47 | 42.21 | 74.00 | -31.79 | Peak |
| 4 3652.610 | 50.98 | 28.89 | 9.39 | 54.47 | 34.79 | 54.00 | -19.21 | Average |
| 5 4953.236 | 57.54 | 31.11 | 10.91 | 54.29 | 45.27 | 74.00 | -28.73 | Peak |
| 6 4953.236 | 49.51 | 31.11 | 10.91 | 54.29 | 37.24 | 54.00 | -16.76 | Average |

Remark:

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

| | | | |
|------------------------|------------------------------------------------------------------|-----------------------|----------------------|
| Product Name: | Nebra Smart Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | Product Model: | HNTIN-868-G |
| Test By: | Yaro | Test mode: | TM 1 |
| Test Frequency: | 1 GHz ~ 6 GHz | Polarization: | Horizontal |
| Test Voltage: | AC 230/50Hz | Environment: | Temp: 24°C Huni: 57% |



| Freq MHz | Read Level dBuV | Antenna Factor dB | Cable Loss Factor dB | Preamp Level dB | Limit Line dBuV/m | Over Line dBuV/m | Over Limit dB | Remark |
|-------------|-----------------------|-------------------------|-------------------------------|-----------------------|-------------------------|------------------------|---------------------|---------|
| | MHz | dBuV | dB/m | dB | dBuV/m | dBuV/m | dB | |
| 1 2924.911 | 58.55 | 28.24 | 8.46 | 54.56 | 40.69 | 70.00 | -29.31 | Peak |
| 2 2924.911 | 50.13 | 28.24 | 8.46 | 54.56 | 32.27 | 50.00 | -17.73 | Average |
| 3 3966.417 | 57.97 | 29.26 | 9.73 | 54.42 | 42.54 | 74.00 | -31.46 | Peak |
| 4 3966.417 | 49.70 | 29.26 | 9.73 | 54.42 | 34.27 | 54.00 | -19.73 | Average |
| 5 5378.783 | 56.36 | 32.03 | 10.70 | 54.32 | 44.77 | 74.00 | -29.23 | Peak |
| 6 5378.783 | 48.53 | 32.03 | 10.70 | 54.32 | 36.94 | 54.00 | -17.06 | Average |

Remark:

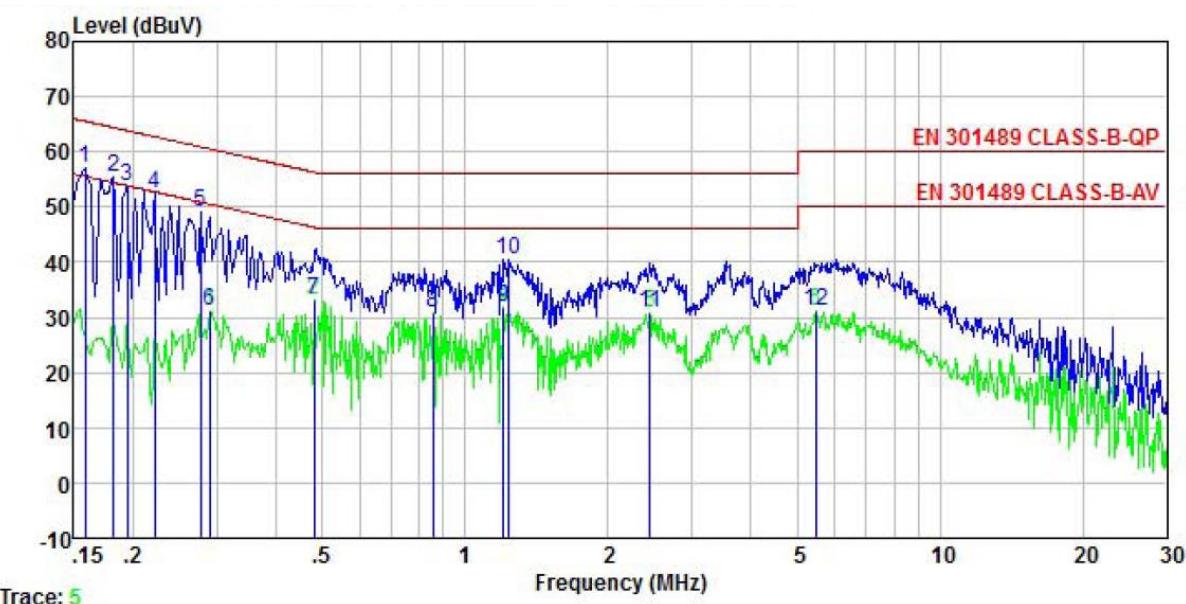
2. Final Level = Receiver Read level + Antenna Factor + Cable Loss + Aux Factor – Preamplifier Factor.
 3. The emission levels of other frequencies are very lower than the limit and not show in test report.

6.1.2 Conducted Emissions

| | | | |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|
| Test Requirement: | ETSI EN301 489-1 | | |
| Test Method: | EN 55032 | | |
| Test Frequency Range: | 150kHz to 30MHz | | |
| 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 setup: | <p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p> | | |
| Test procedure | <p>The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). Which provide a 50ohm/50uH coupling impedance for the measuring equipment. 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). 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 EN55032 Class B on conducted measurement.</p> | | |
| Test Instruments: | Refer to section 5.10 for details | | |
| Test mode: | Refer to section 5.3 for details | | |
| Test results: | Passed | | |

Measurement Data:

| | | | |
|------------------------|------------------------------------------------------------------|-----------------------|------------------------|
| Product name: | Nebra Smart Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | Product model: | HNTIN-868-G |
| Test by: | Yaro | Test mode: | TM 1 |
| Test frequency: | 150 kHz ~ 30 MHz | Phase: | Line |
| Test voltage: | AC 230 V/50 Hz | Environment: | Temp: 22.5°C Huni: 55% |

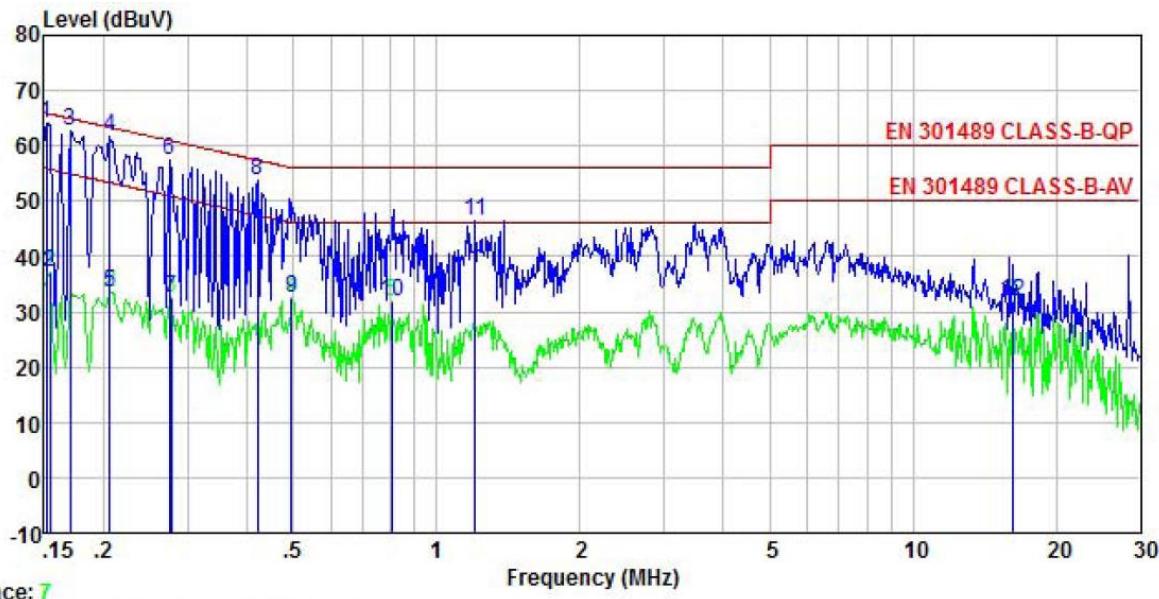


| Freq | Read | LISN | Aux | Cable | Limit | Over | Remark | |
|------|-------|--------|--------|-------|-------|-------|--------|----------------|
| | Level | Factor | Factor | Loss | | | | |
| | MHz | dBuV | dB | dB | dB | dBuV | dB | dB |
| 1 | 0.158 | 46.80 | 10.20 | 0.01 | 0.01 | 57.02 | 65.56 | -8.54 QP |
| 2 | 0.182 | 45.14 | 10.20 | 0.00 | 0.01 | 55.35 | 64.42 | -9.07 QP |
| 3 | 0.194 | 43.44 | 10.20 | 0.00 | 0.03 | 53.67 | 63.84 | -10.17 QP |
| 4 | 0.222 | 42.35 | 10.20 | 0.00 | 0.03 | 52.58 | 62.74 | -10.16 QP |
| 5 | 0.277 | 38.74 | 10.20 | 0.01 | 0.02 | 48.97 | 60.90 | -11.93 QP |
| 6 | 0.289 | 21.00 | 10.20 | 0.01 | 0.03 | 31.24 | 50.54 | -19.30 Average |
| 7 | 0.481 | 22.89 | 10.20 | 0.02 | 0.03 | 33.14 | 46.32 | -13.18 Average |
| 8 | 0.857 | 20.63 | 10.20 | 0.06 | 0.04 | 30.93 | 46.00 | -15.07 Average |
| 9 | 1.203 | 21.38 | 10.20 | 0.10 | 0.09 | 31.77 | 46.00 | -14.23 Average |
| 10 | 1.229 | 30.03 | 10.21 | 0.11 | 0.10 | 40.45 | 56.00 | -15.55 QP |
| 11 | 2.448 | 20.08 | 10.29 | 0.24 | 0.14 | 30.75 | 46.00 | -15.25 Average |
| 12 | 5.476 | 20.15 | 10.30 | 0.71 | 0.09 | 31.25 | 50.00 | -18.75 Average |

Notes:

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

| | | | |
|------------------------|------------------------------------------------------------------|-----------------------|------------------------|
| Product name: | Nebra Smart Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | Product model: | HNTIN-868-G |
| Test by: | Yaro | Test mode: | TM 1 |
| Test frequency: | 150 kHz ~ 30 MHz | Phase: | Neutral |
| Test voltage: | AC 230 V/50 Hz | Environment: | Temp: 22.5°C Huni: 55% |

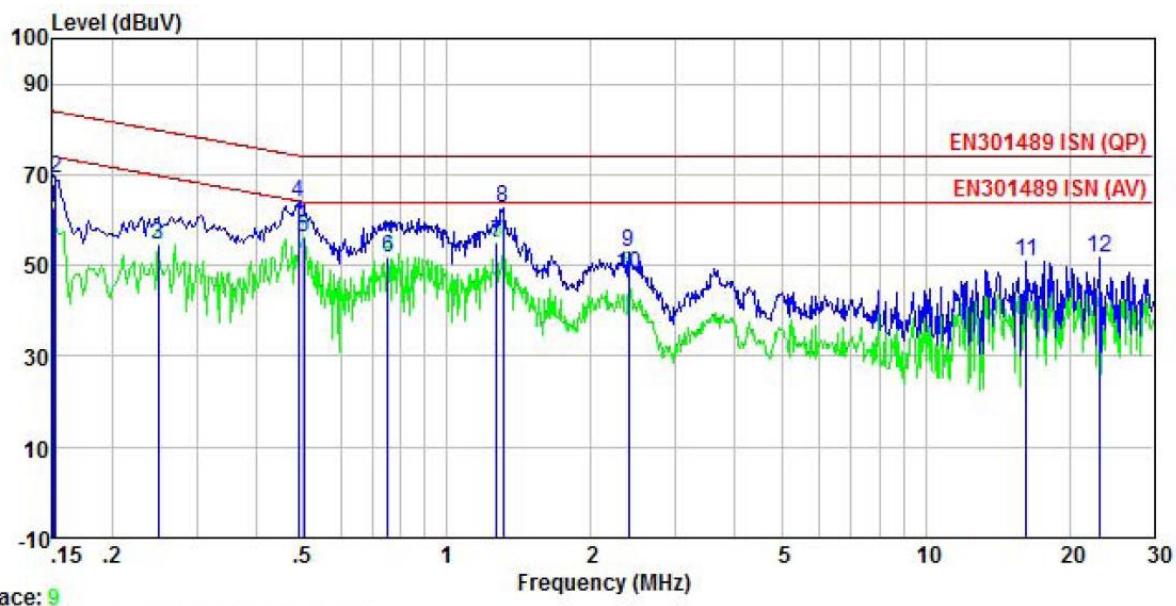


| Freq | Read | LISM | Aux | Cable | Limit | Over | Remark | |
|------|--------|-------|--------|--------|-------|-------|--------|----------------|
| | Freq | Level | Factor | Factor | | | | |
| | MHz | dBuV | dB | dB | dB | dBuV | dB | dB |
| 1 | 0.152 | 53.79 | 10.20 | 0.01 | 0.01 | 64.01 | 65.91 | -1.90 QP |
| 2 | 0.154 | 26.80 | 10.20 | 0.01 | 0.01 | 37.02 | 55.78 | -18.76 Average |
| 3 | 0.170 | 52.64 | 10.20 | 0.01 | 0.01 | 62.86 | 64.94 | -2.08 QP |
| 4 | 0.206 | 51.59 | 10.20 | 0.00 | 0.04 | 61.83 | 63.36 | -1.53 QP |
| 5 | 0.206 | 23.39 | 10.20 | 0.00 | 0.04 | 33.63 | 53.36 | -19.73 Average |
| 6 | 0.274 | 47.11 | 10.20 | 0.01 | 0.02 | 57.34 | 60.98 | -3.64 QP |
| 7 | 0.277 | 22.17 | 10.20 | 0.01 | 0.02 | 32.40 | 50.90 | -18.50 Average |
| 8 | 0.421 | 43.63 | 10.20 | -0.04 | 0.04 | 53.83 | 57.42 | -3.59 QP |
| 9 | 0.497 | 22.38 | 10.20 | 0.03 | 0.03 | 32.64 | 46.05 | -13.41 Average |
| 10 | 0.804 | 21.51 | 10.20 | 0.06 | 0.03 | 31.80 | 46.00 | -14.20 Average |
| 11 | 1.203 | 36.23 | 10.20 | 0.10 | 0.09 | 46.62 | 56.00 | -9.38 QP |
| 12 | 16.226 | 18.49 | 10.68 | 2.38 | 0.16 | 31.71 | 50.00 | -18.29 Average |

Notes:

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

| | | | |
|------------------------|------------------------------------------------------------------|-----------------------|------------------------|
| Product name: | Nebra Smart Indoor LoRa Gateway / Nebra HNT Indoor Hotspot Miner | Product model: | HNTIN-868-G |
| Test by: | Yaro | Test mode: | Working mode |
| Test frequency: | 150 kHz ~ 30 MHz | Phase: | Line |
| Test voltage: | AC 230 V/50 Hz | Environment: | Temp: 22.5°C Huni: 55% |



| Freq MHz | Read Level | LISN Factor | Aux Factor | Cable Loss | Limit Level | Over Line | Over Limit | Remark |
|-------------|---------------|----------------|---------------|---------------|----------------|--------------|---------------|---------|
| | dBuV | dB | dB | dB | dBuV | dBuV | dB | |
| 1 0.150 | 52.58 | 9.95 | 0.00 | 0.01 | 62.54 | 74.00 | -11.46 | Average |
| 2 0.152 | 59.17 | 9.95 | 0.00 | 0.01 | 69.13 | 83.87 | -14.74 | QP |
| 3 0.249 | 44.61 | 9.83 | 0.00 | 0.01 | 54.45 | 69.78 | -15.33 | Average |
| 4 0.489 | 54.04 | 9.69 | 0.00 | 0.03 | 63.76 | 74.19 | -10.43 | QP |
| 5 0.502 | 46.46 | 9.69 | 0.00 | 0.03 | 56.18 | 64.00 | -7.82 | Average |
| 6 0.751 | 42.24 | 9.53 | 0.00 | 0.03 | 51.80 | 64.00 | -12.20 | Average |
| 7 1.269 | 45.19 | 9.58 | 0.00 | 0.10 | 54.87 | 64.00 | -9.13 | Average |
| 8 1.310 | 52.83 | 9.59 | 0.00 | 0.11 | 62.53 | 74.00 | -11.47 | QP |
| 9 2.396 | 43.25 | 9.65 | 0.00 | 0.15 | 53.05 | 74.00 | -20.95 | QP |
| 10 2.396 | 38.07 | 9.65 | 0.00 | 0.15 | 47.87 | 64.00 | -16.13 | Average |
| 11 16.226 | 40.90 | 9.81 | 0.00 | 0.16 | 50.87 | 74.00 | -23.13 | QP |
| 12 23.140 | 41.60 | 9.76 | 0.00 | 0.17 | 51.53 | 74.00 | -22.47 | QP |

Notes:

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

6.1.3 Harmonics Test Results

| | |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | ETSI EN 301 489-1/3/17/19: EN61000-3-2 |
| Test Method: | N/A: See Remark Below |
| Remark: | <p>There is no need for Harmonics test to be performed on this product (rated power is less than 75W) in accordance with EN 61000-3-2.</p> <p>For further details, please refer to Clause 7, Note 1 of EN 61000-3-2 which states:</p> <p>“For the following categories of equipment limits are not specified in this edition of the standard.</p> <p>Note 1: Equipment with a rated power of 75W or less, other than lighting equipment.”</p> |

6.1.4 Flicker Test Results

| | |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | ETSI EN 301 489-1/3/17/19: EN61000-3-3 |
| Test Method: | N/A: See Remark Below |
| Remark: | <ol style="list-style-type: none">1. The appropriate requirements of EN 61000-3-3 [9] for voltage fluctuations and flicker apply for equipment covered by the scope of the present document with an input current up to and including 16A per phase. For equipment with an input current of greater than 16A per phase EN 61000-3-11 [12] applies.2. As the section 6.1 of EN 61000-3-3, “Devices and Equipment that do (with the utmost probability) not generate relevant voltage fluctuations or flicker need not to be tested”. |

6.2 EMS (Immunity)

Performance Criteria of ETSI EN 301 489-1/3/17/19, sub clause 6

| Criteria | Performance Criteria of EN 301 489-1 clause 6 |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CT/CR | During the test, the equipment shall: <ul style="list-style-type: none">• continue to operate as intended;• not unintentionally transmit;• not unintentionally change its operating state;• not unintentionally change critical stored data. |
| TT/TR | For all ports and transient phenomena with the exception described below, the following applies: <ul style="list-style-type: none">• The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.• After application of the transient phenomena, the equipment shall operate as intended. For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies: <ul style="list-style-type: none">• For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.• For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost. |

Performance Criteria of EN 301 489-3 clause 6

In the table below:

- performance criterion A applies for immunity tests with phenomena of a continuous nature;
- performance criterion B applies for immunity tests with phenomena of a transient nature.

NOTE: Whether a phenomenon is considered transient, continuous or otherwise is indicated in the test procedures for the phenomenon in ETSI EN 301 489-1 [1], clause 9.

Table 2: Performance Requirements

| Criterion | During test | After test |
|-----------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A | Operate as intended No loss of function No unintentional responses | Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions |
| B | May show loss of function No unintentional responses | Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions |

| Criteria | Performance Criteria of EN 301 489-17 clause 6 |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CT | The performance criteria A shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted. |
| TT | The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted. |
| CR | The performance criteria A shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted. |
| TR | The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted. |

Table 1: Performance criteria

| Criteria | During test | After test (i.e. as a result of the application of the test) |
|----------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| A | Shall operate as intended. (see note). Shall be no loss of function. Shall be no unintentional transmissions. | Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data. |
| B | May be loss of function. | Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data. |
| C | May be loss of function. | Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data. |

NOTE: Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.

6.2.2 Minimum performance level

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.

| Criteria | Performance Criteria of EN 301 489-19 clause 6 |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CR | <p>For the EUT, excluding spot frequency tests as part of the immunity test with radiated RF electromagnetic fields (see ETSI EN 301 489-1 [1], clause 9.2):</p> <ul style="list-style-type: none">• the general performance criteria set out in clause 6.1;• during the test no false calls shall occur;• at the conclusion of the test comprising the series of individual exposures the EUT shall operate as intended with no loss of functions or stored data (messages), as declared by the manufacturer. <p>For the spot frequency test as part of the immunity test with radiated RF electromagnetic fields (see ETSIEN 301 489-1 [1], clause 9.2) the EUT shall be assessed by monitoring the accuracy of the call received alert signal.</p> |
| TR | <p>For the EUT:</p> <ul style="list-style-type: none">• the general performance criteria set out in clause 6.1;• during the test no false calls shall occur;• at the conclusion of the test comprising the series of individual exposures, the EUT shall operate as intended with no loss of function and/or stored data (messages), as declared by the manufacturer. |

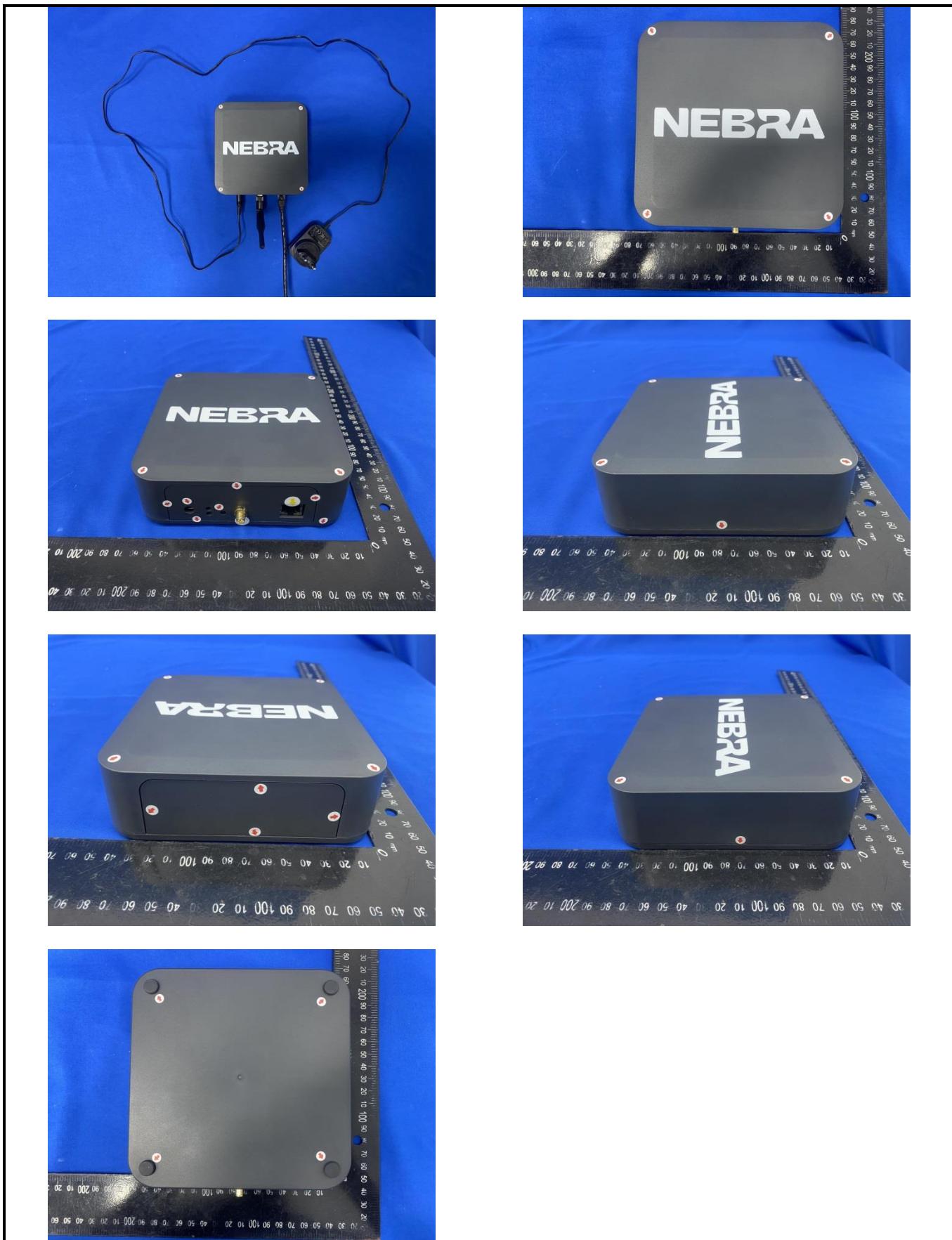
6.2.1 Electrostatic Discharge

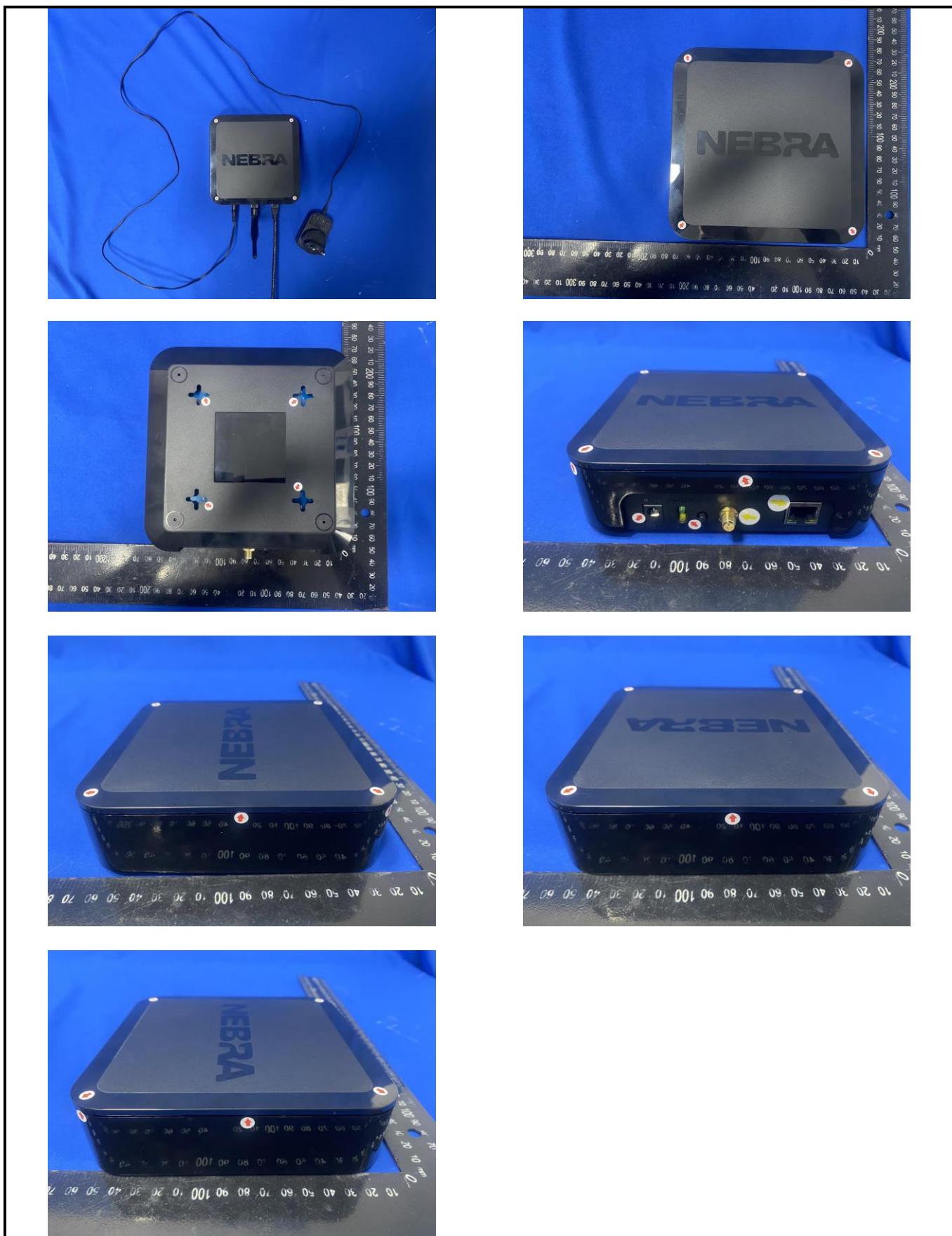
| | | | | | | |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|-----|---------|--------|
| Test Requirement: | ETSI EN301489-1 | | | | | |
| Test Method: | EN61000-4-2 | | | | | |
| Discharge Voltage: | Contact Discharge, HCP and VCP: $\pm 2\text{kV}$, $\pm 4\text{kV}$, Air Discharge: $\pm 2\text{kV}$, $\pm 4\text{kV}$, $\pm 8\text{kV}$ | | | | | |
| Polarity: | Positive & Negative | | | | | |
| Number of Discharge: | Contact Discharge: Minimum 25 times at each test point, Air Discharge: Minimum 10 times at each test point. | | | | | |
| Discharge Mode: | Single Discharge | | | | | |
| Discharge Period: | 1 second minimum | | | | | |
| Testsetup: | | | | | | |
| Test Procedure: | <p>1) Air discharge: The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure was repeated until all the air discharge completed</p> <p>2) Contact discharge: The test was applied on conductive surfaces of EUT. the generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. the tip of the discharge electrode was touch the EUT before the discharge switch was operated.</p> <p>3) Indirect discharge for horizontal coupling plane At least 10 single discharges shall be applied at the front edge of each HCP opposite the centre point of each unit of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.Consideration should be given to exposing all sides of the EUT.</p> <p>4) Indirect discharge for vertical coupling plane At least 10 single discharges were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.</p> | | | | | |
| Testenvironment: | Temp.: | 26°C | Humid.: | 54% | Press.: | 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.3 for details | | | | | |
| Test results: | Passed | | | | | |

Measurement Record:

| Test mode: | TM 1 | | | |
|-----------------------------------------------------|--------------------------------------------------|-------------------|--------------------------------------|--------|
| Test points: | I: Please refer to red arrows as below plots | | | |
| | II: Please refer to yellow arrows as below plots | | | |
| Direct discharge | | | | |
| Discharge Voltage (KV) | Type of discharge | Test points | Observations (Performance Criterion) | Result |
| ± 2,± 4 | Contact | II | TT/TR | Pass |
| ± 2,± 4,± 8 | Air | I | TT/TR | Pass |
| Indirect discharge | | | | |
| Discharge Voltage (KV) | Type of discharge | Test points | Observation Performance | Result |
| ± 2,± 4 | HCP-Bottom/Top/ Front/Back/Left/Right | Edge of the HCP | TT/TR | Pass |
| ± 2,± 4 | VCP-Front/Back /Left/Right | Center of the VCP | TT/TR | Pass |
| <i>Remark:</i> | | | | |
| <i>Red arrow: air discharge test points.</i> | | | | |
| <i>Yellow arrow: contact discharge test points.</i> | | | | |

ESD Test points as below:





6.2.2 Radiated Immunity

| | | | | | | |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|-----|---------|--------|
| Test Requirement: | ETSI EN 301 489-1 | | | | | |
| Test Method: | EN61000-4-3 | | | | | |
| Frequency range: | 80MHz to 6GHz | | | | | |
| Test Level: | 3V/m | | | | | |
| Modulation: | 80%, 1kHz Amplitude Modulation | | | | | |
| Testsetup: | | | | | | |
| Test Procedure: | <ol style="list-style-type: none"> For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table-top items. If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length. The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area). The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Where the frequency range was swept incrementally, the step size was not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0,5 s. The test normally was performed with the generating antenna facing each side of the EUT. The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The EUT was performed in a configuration to actual installation conditions, a video camera and/or audio monitor were used to monitor the performance of the EUT. | | | | | |
| Test environment: | Temp.: | 26°C | Humid.: | 54% | Press.: | 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.3 for details | | | | | |
| Test results: | Passed | | | | | |

Measurement Record:

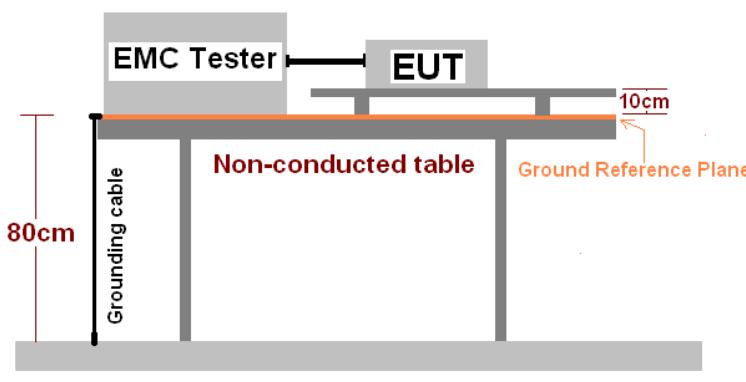
Test mode: TM 1

| Frequency | Level | Modulation | Antenna Polarization | EUT Face | Observations (Performance Criterion) | Result | | |
|------------|-------|-------------------------------------------------------|----------------------|----------|--------------------------------------|--------|--|--|
| 80MHz-6GHz | 3V/m | 1kHz, 80% Amp. Mod, 1% increment, dwell time=3seconds | V | Front | CT/CR | Pass | | |
| | | | H | | | | | |
| | | | V | Rear | | | | |
| | | | H | | | | | |
| | | | V | Left | | | | |
| | | | H | | | | | |
| | | | V | Right | | | | |
| | | | H | | | | | |
| | | | V | Top | | | | |
| | | | H | | | | | |
| | | | V | Bottom | | | | |
| | | | H | | | | | |

Special conditions of ETSI EN 301 489-19 V2.1.1 (2019-04)

| Frequency | Level | Modulation | Antenna Polarization | EUT Face | Observations (Performance Criterion) | Result | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------|----------------------|----------|--------------------------------------|--------|--|--|
| 80 MHz; 104 MHz; 136 MHz; 165 MHz; 200 MHz; 260 MHz; 330 MHz; 430 MHz; 560 MHz; 715 MHz ± 1 MHz; 920 MHz ± 1 MHz. | 3V/m | (measured unmodulated) 100 % modulated by 200 Hz pulses of equal mark to space ratio | V | Front | CT/CR | Pass | | |
| | | | H | | | | | |
| | | | V | Rear | | | | |
| | | | H | | | | | |
| | | | V | Left | | | | |
| | | | H | | | | | |
| | | | V | Right | | | | |
| | | | H | | | | | |
| | | | V | Top | | | | |
| | | | H | | | | | |
| | | | V | Bottom | | | | |
| | | | H | | | | | |

6.2.3 Electrical Fast Transients

| | | | | | | |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|-----|---------|--------|
| Test Requirement: | ETSI EN 301 489-1 | | | | | |
| Test Method: | EN 61000-4-4 | | | | | |
| Test Level: | $\pm 1.0\text{kV}$ on AC port | | | | | |
| Polarity: | Positive & Negative | | | | | |
| Repetition Frequency: | 5kHz | | | | | |
| Burst Duration: | 15ms | | | | | |
| Burst Period: | 300ms | | | | | |
| Test Duration: | 2 minute per level & polarity | | | | | |
| Testsetup: |  | | | | | |
| Test Procedure: | <p>The EUT and its simulators were placed on the ground reference plane and were insulated from it by a wood support 0.1m + 0.01m thick. The ground reference plane was 1m*1m metallic sheet with 0.65mm minimum thickness. This reference groundplane was project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5m. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.</p> <p>Test on SignalPorts, TelecommunicationPorts and ControlPorts: The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT with burst noise for 2 minutes.</p> <p>Test on power supply ports: The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal. Each of the Line and Neutral conductors is impressed with burst noise for 2 minutes. The length of the signal and power lines between the coupling device and the EUT is 0.5m</p> | | | | | |
| Testenvironment: | Temp.: | 26°C | Humid.: | 54% | Press.: | 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.3 for details | | | | | |
| Test results: | Passed | | | | | |

Measurement Record:

Test mode: TM 1

| Lead under Test | Level(kV) | Coupling Direct/Clamp | Observations (Performance Criterion) | Result |
|-----------------|-----------|--------------------------|-----------------------------------------|--------|
| L | ±1.0 | Direct | TT/TR | Pass |
| N | ± 1.0 | Direct | TT/TR | Pass |
| L-N | ± 1.0 | Direct | TT/TR | Pass |
| LAN | ± 0.5 | Direct | A | Pass |

6.2.4 Surge

| | | | | | | |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|-----|---------|--------|
| Test Requirement: | ETSI EN 301 489-1 | | | | | |
| Test Method: | EN61000-4-5 | | | | | |
| Test Level: | $\pm 1\text{kV}$ Live to Neutral: Differential mode $\pm 2\text{kV}$ Live to Earth or Neutral to Earth: Common mode | | | | | |
| Polarity: | Positive & Negative | | | | | |
| Test Interval: | 60s between each surge | | | | | |
| No. of surges: | 5 positive, 5 negative at 0° , 90° , 180° , 270° . | | | | | |
| Performance Criterion: | B | | | | | |
| Testsetup: | | | | | | |
| Test Procedure: | <ol style="list-style-type: none"> For line-to-line coupling mode, provide a $1\text{kV} 1.2/50\mu\text{s}$ voltage surge (at open-circuit condition) and $8/20\mu\text{s}$ current surge to EUT selected points, and for active line / neutral lines to ground are same except test level is 2kV. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are applied during test. Different phase angles are done individually. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test. | | | | | |
| Test environment: | Temp.: | 26°C | Humid.: | 53% | Press.: | 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.3 for details | | | | | |
| Test results: | Passed | | | | | |

Measurement Record:

Test mode: TM 1

| Location | Level(kV) | Pulse No | Surge Interval | Phase(deg) | Observations (Performance Criterion) | Result |
|----------|-----------|----------|----------------|------------|--------------------------------------|--------|
| L-N | ± 1 | 5 | 60s | 0° | TT/TR | Pass |
| | | | | 90° | | |
| | | | | 180° | | |
| | | | | 270° | | |
| LAN | ± 1 | 5 | 60s | / | A | Pass |

6.2.5 Injected Currents susceptibility Test

| | | | | | | |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|-----|---------|--------|
| Test Requirement: | ETSI EN301489-1 | | | | | |
| Test Method: | EN61000-4-6 | | | | | |
| Frequency range: | 0.15MHz to 80MHz | | | | | |
| Test Level: | 3V rms on AC Ports (unmodulated emf into 150 Ω) | | | | | |
| Modulation: | 80%, 1kHz Amplitude Modulation | | | | | |
| Testsetup: | <p>Shielding Room</p> | | | | | |
| Test Procedure: | <ol style="list-style-type: none"> Let the EUT work in test mode and test it. The EUT are placed on an insulating support 0.1m high above a groundreference plane. CDN (coupling and decoupling device) is placed on theground plane about 0.3m from EUT. Cables between CDN and EUT are asshort as possible, and their height above the ground reference plane shall bebetween 30 and 50 mm (where possible). The disturbance signal described below is injected to EUT through CDN. The EUT operates within its operational mode(s) under intended climaticconditions after power on. The frequency range is swept from 0.150MHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sinewave. The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency isswept incrementally; the step size shall not exceed 1% of the start andthereafter 1% of the preceding frequency value. Recording the EUT operating situation during compliance testing and decidethe EUT immunity criterion. | | | | | |
| Testenvironment: | Temp.: | 26°C | Humid.: | 53% | Press.: | 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.3 for details | | | | | |
| Test results: | Passed | | | | | |

Measurement Record:

Test mode: TM 1

| Frequency | Injected Position | Test Level | Modulation | Step Size | Dwell Time | Observations (Performance Criterion) | Result |
|-----------------|-------------------|------------|---------------------|-----------|------------|--------------------------------------|--------|
| 150kHz to 80MHz | AC Mains | 3Vrms | 80%, 1kHz Amp. Mod. | 1% | 2s | CT/CR | Pass |
| 150kHz to 80MHz | LAN | 3Vrms | 80%, 1kHz Amp. Mod. | 1% | 2s | CT/CR | Pass |

6.2.6 Voltage Dip and Voltage Interruptions

| | | | | | | |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|-----|---------|--------|
| Test Requirement: | ETSI EN301489-1 | | | | | |
| Test Method: | EN61000-4-11 | | | | | |
| Test Level: | 0% of VT(Supply Voltage) for 0.5 period 0% of VT(Supply Voltage) for 1.0 period 70% of VT(Supply Voltage) for 25 period 0% of VT(Supply Voltage) for 250 period | | | | | |
| No. of Dips / Interruptions: | 3 per Level | | | | | |
| Testsetup: | | | | | | |
| Test Procedure: | <ol style="list-style-type: none"> The EUT and test generator were setup as shown on above setup photo. The interruptions are introduced at selected phase angles with specified duration. Record any degradation of performance. | | | | | |
| Testenvironment: | Temp.: | 26°C | Humid.: | 53% | Press.: | 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.3 for details | | | | | |
| Test results: | Passed | | | | | |

Measurement Record:

Test mode: TM 1

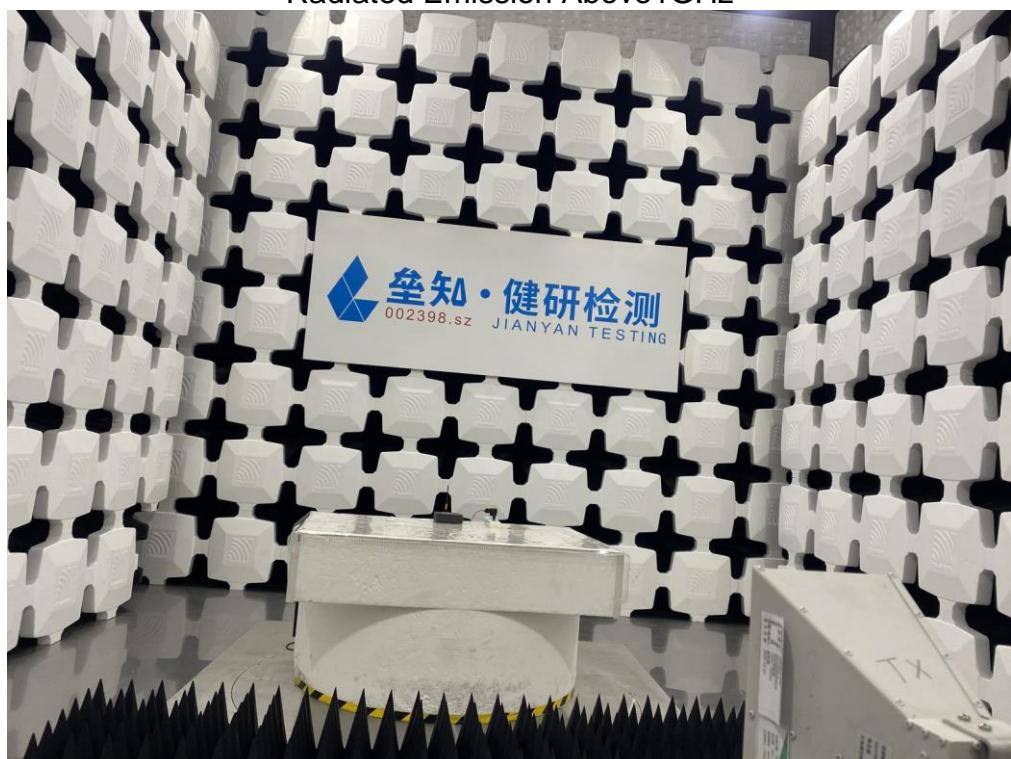
| Test Level % U _T | Duration (Periods) | Phase angle | No of dropout | Time between dropout | Observations (Performance Criterion) | Result |
|--------------------------------|-----------------------|---------------------|---------------|----------------------|-----------------------------------------|--------|
| 0 | 0.5 | 0°, 90°, 180°, 270° | 3 | 10s | TT/TR | Pass |
| 0 | 1 | 0°, 90°, 180°, 270° | 3 | 10s | | |
| 70 | 25 | 0°, 90°, 180°, 270° | 3 | 10s | | |
| 0 | 250 | 0°, 90°, 180°, 270° | 3 | 10s | | |

7 Test Setup Photo

Radiated Emission Below1GHz



Radiated Emission Above1GHz

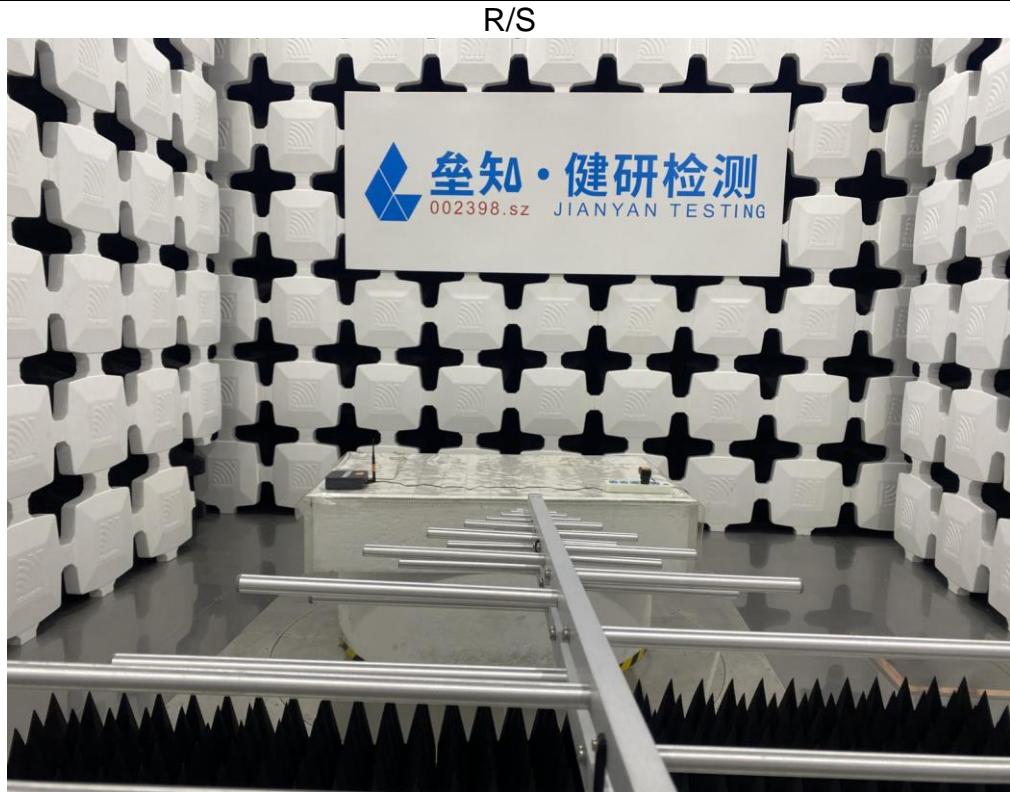


Conducted Emission (for AC)

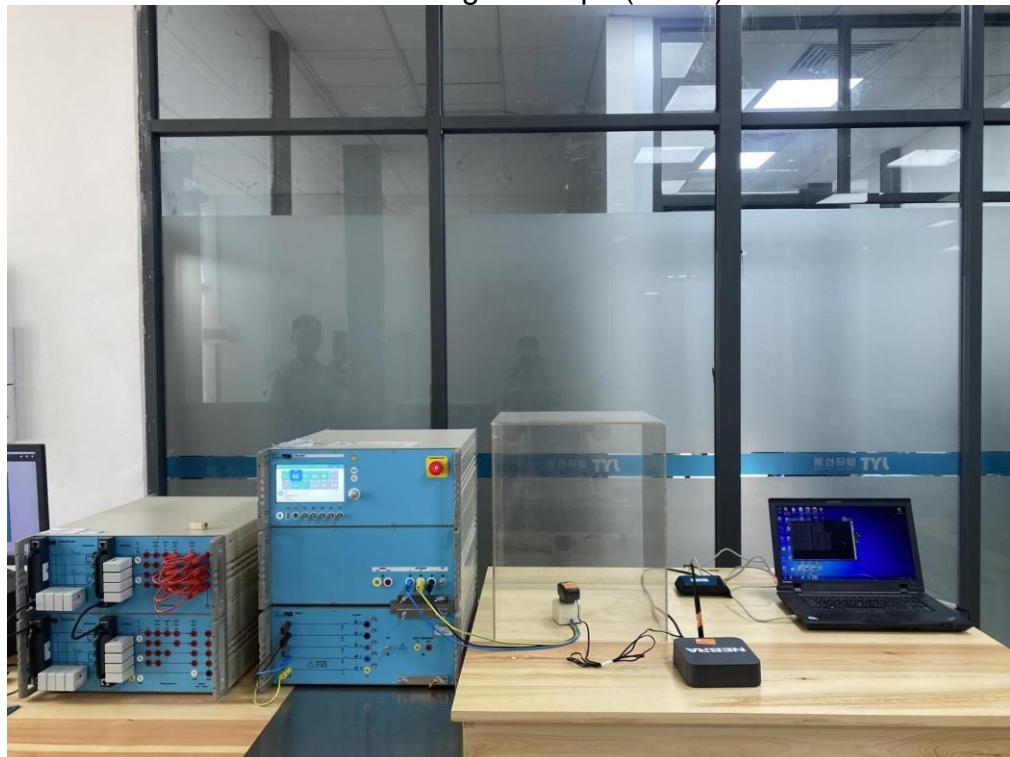


Conducted Emission (for LAN)





EFT/B / Surge / V-dips (fo AC)



Surge (for LAN)



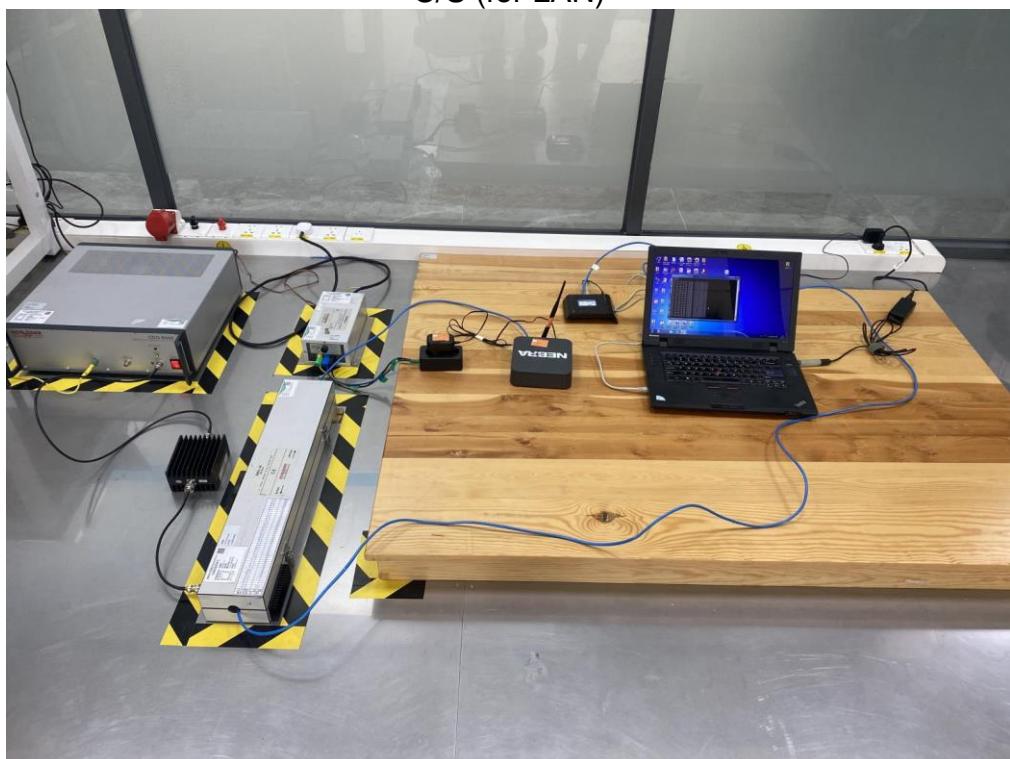
EFT/B (for LAN)



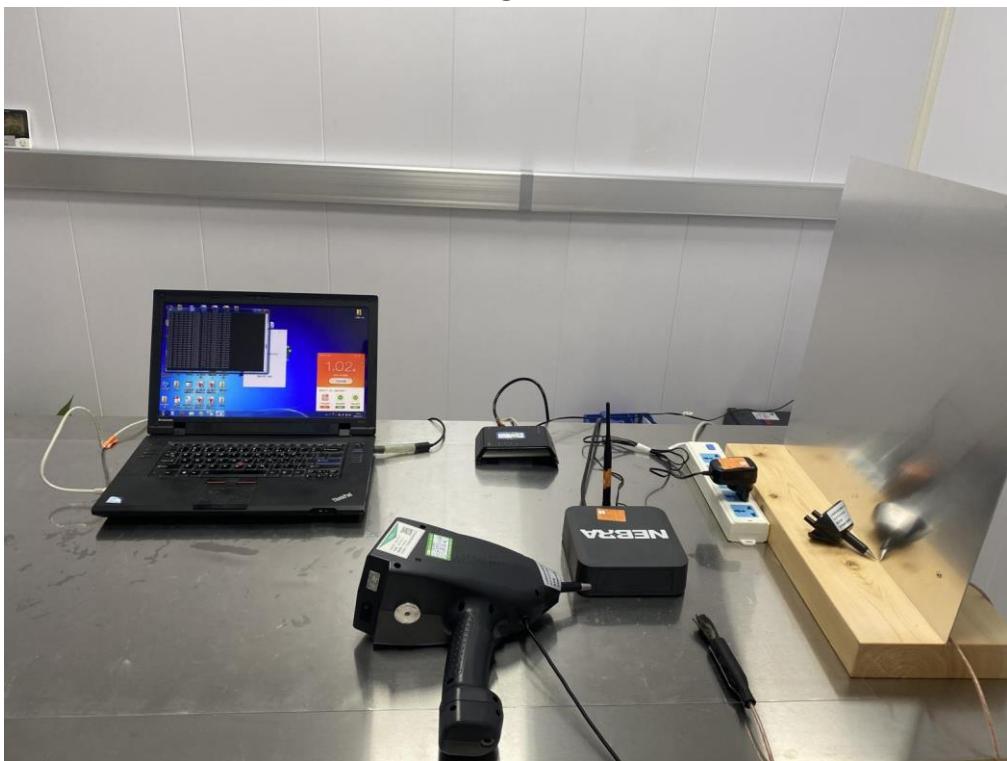
C/S (for AC)



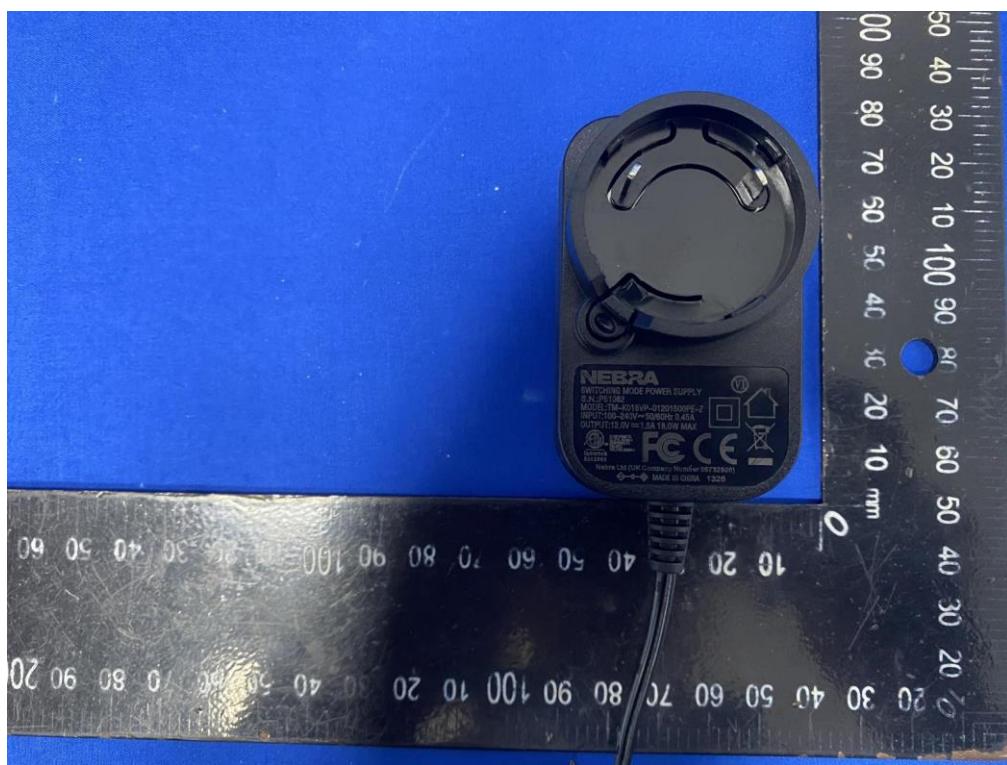
C/S (for LAN)

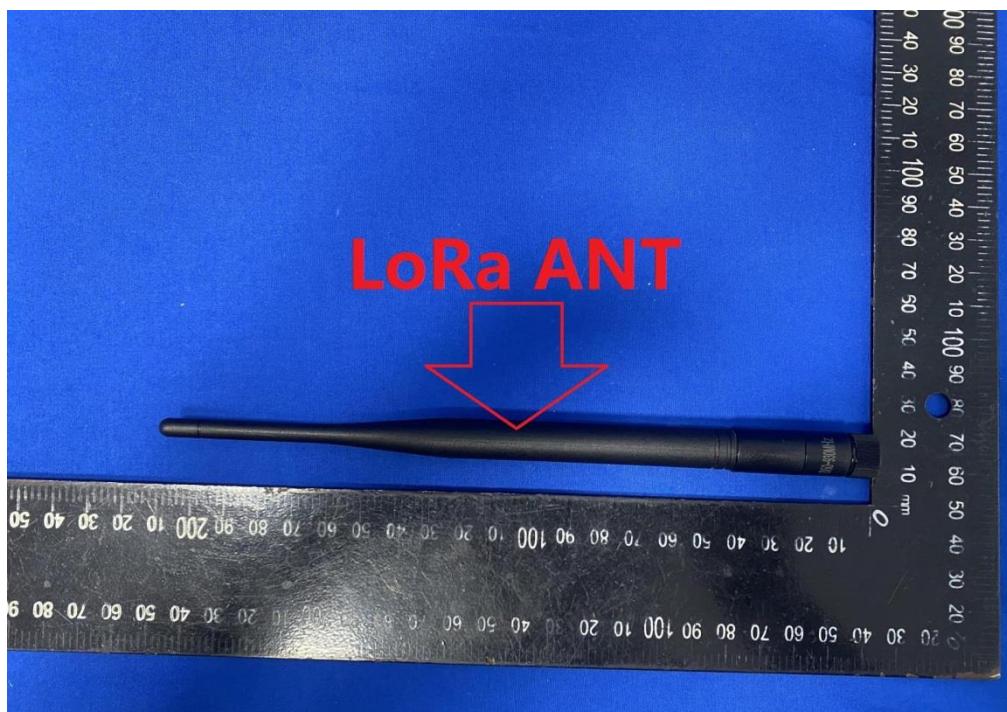


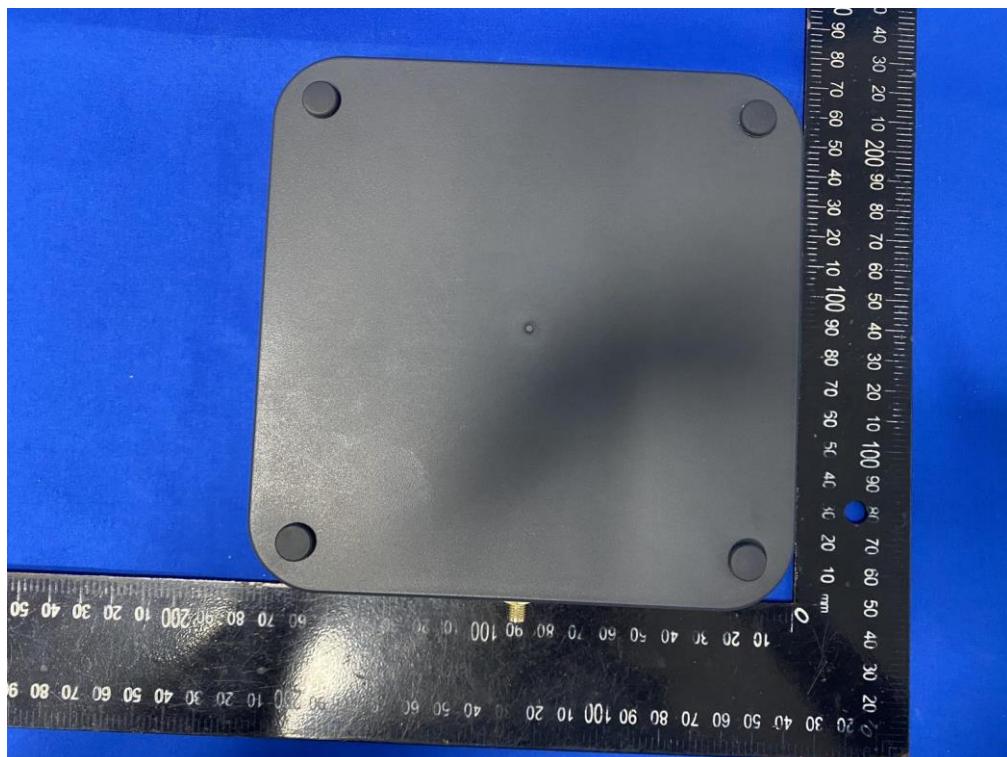
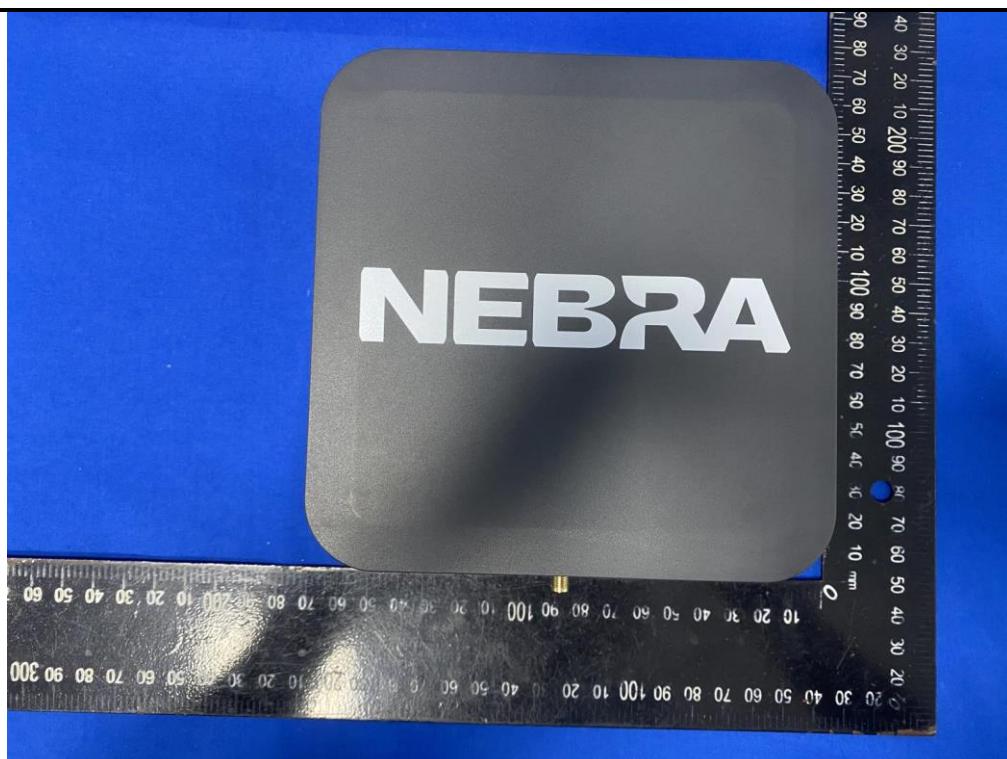
ESD



8 EUT Constructional Details

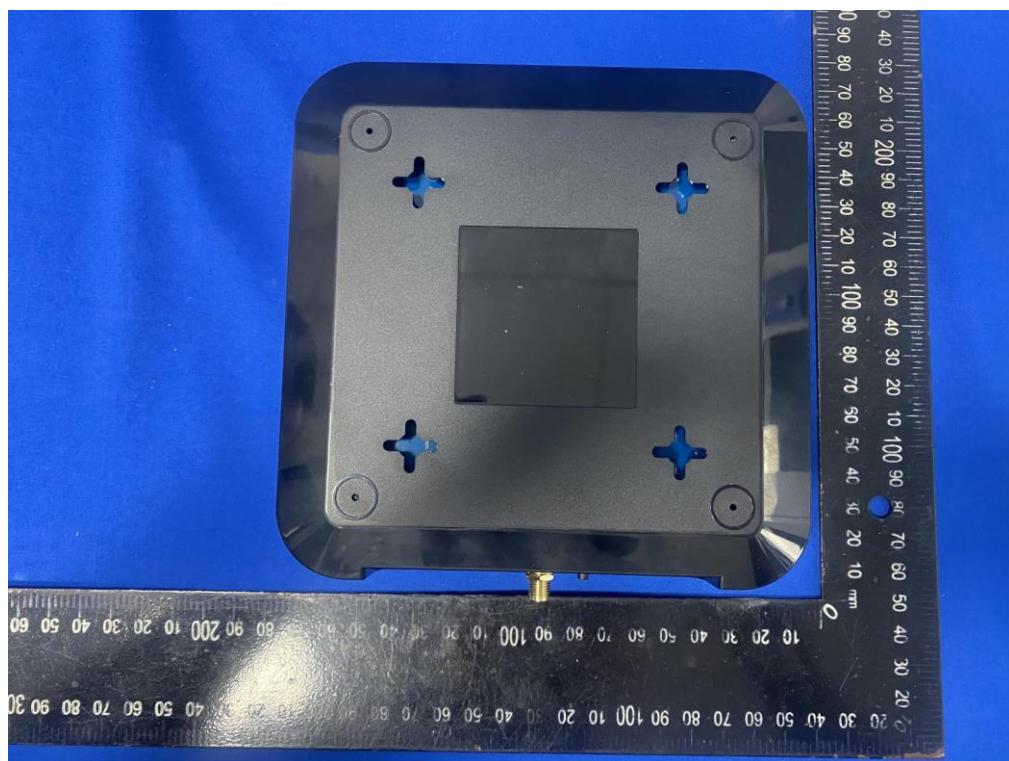
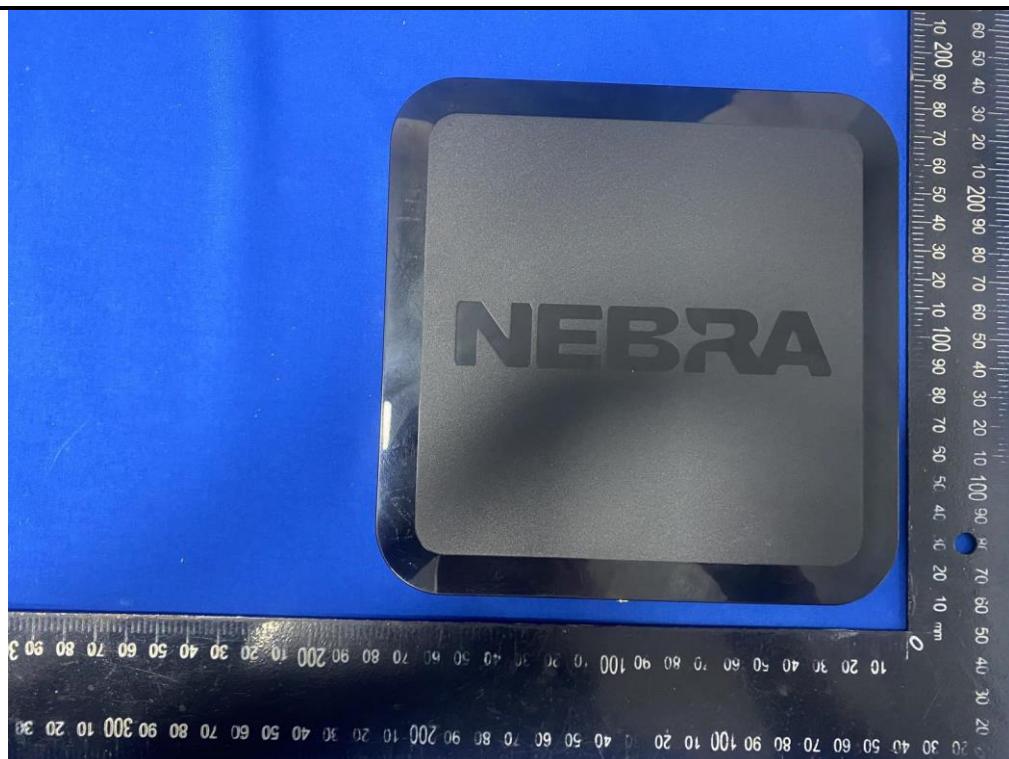






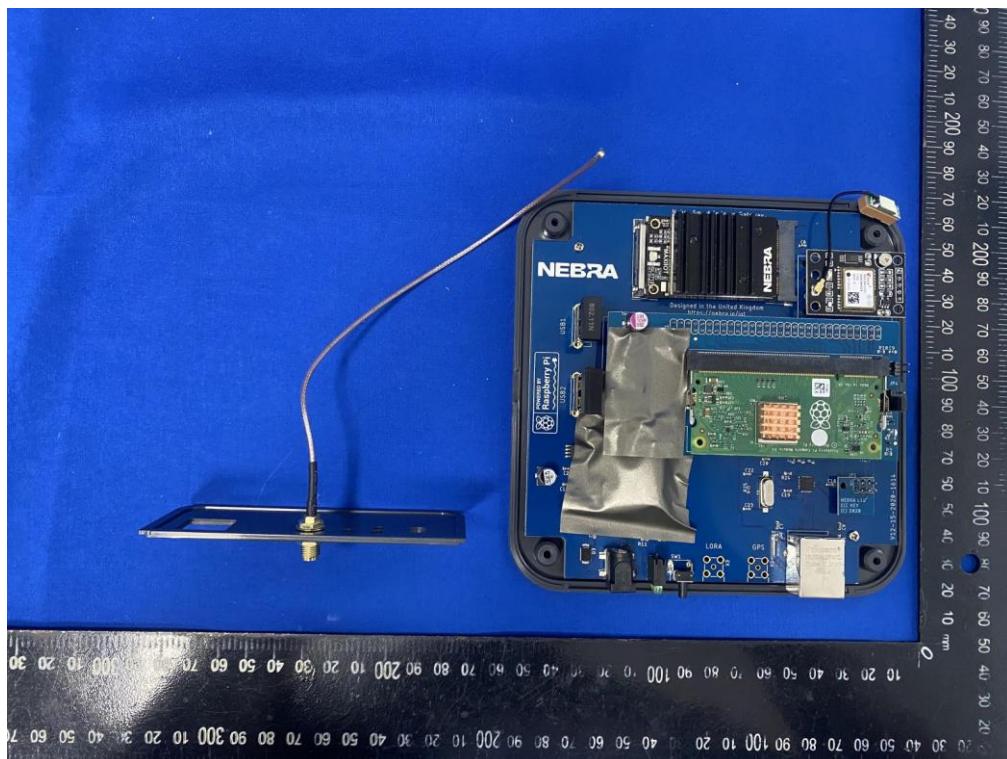
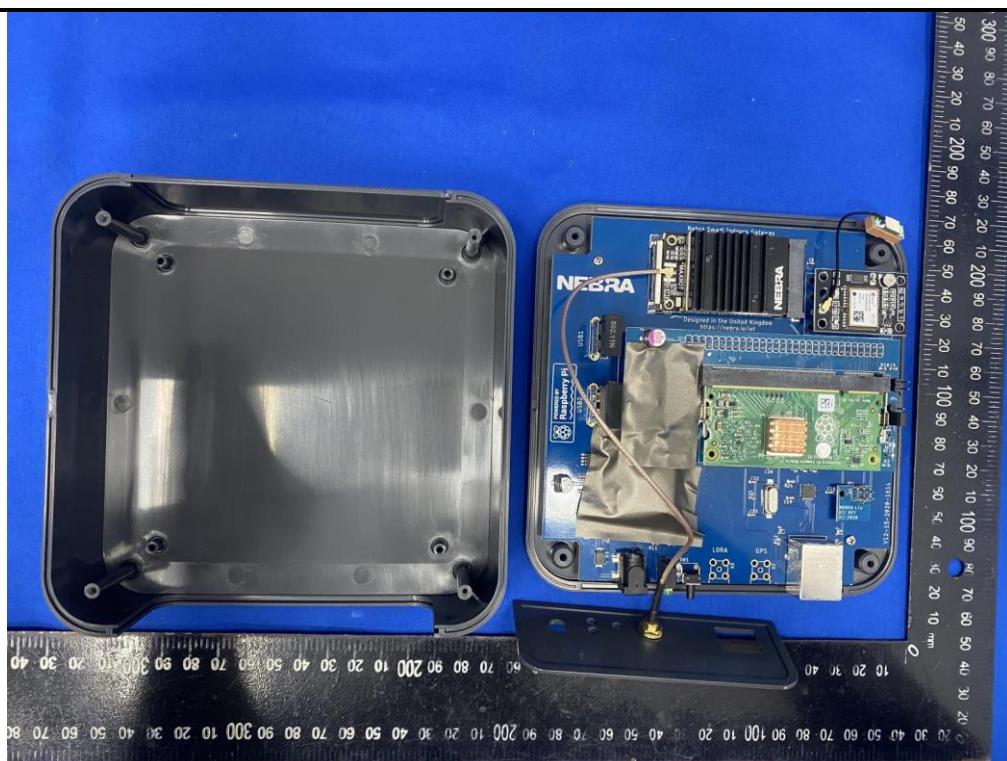


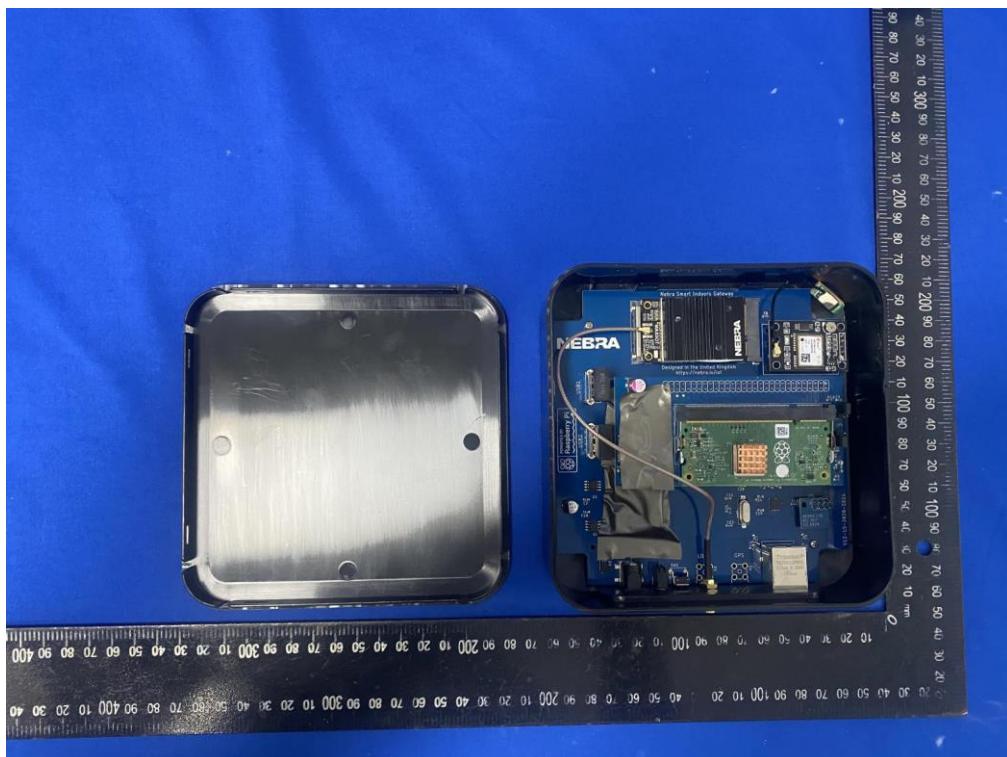
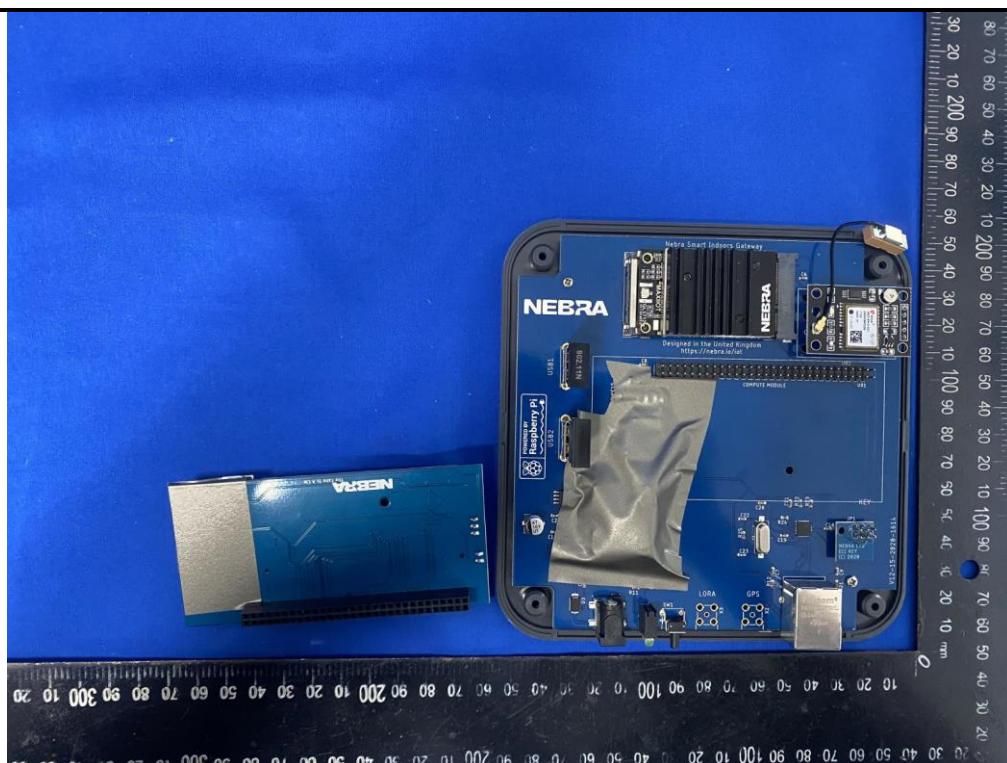


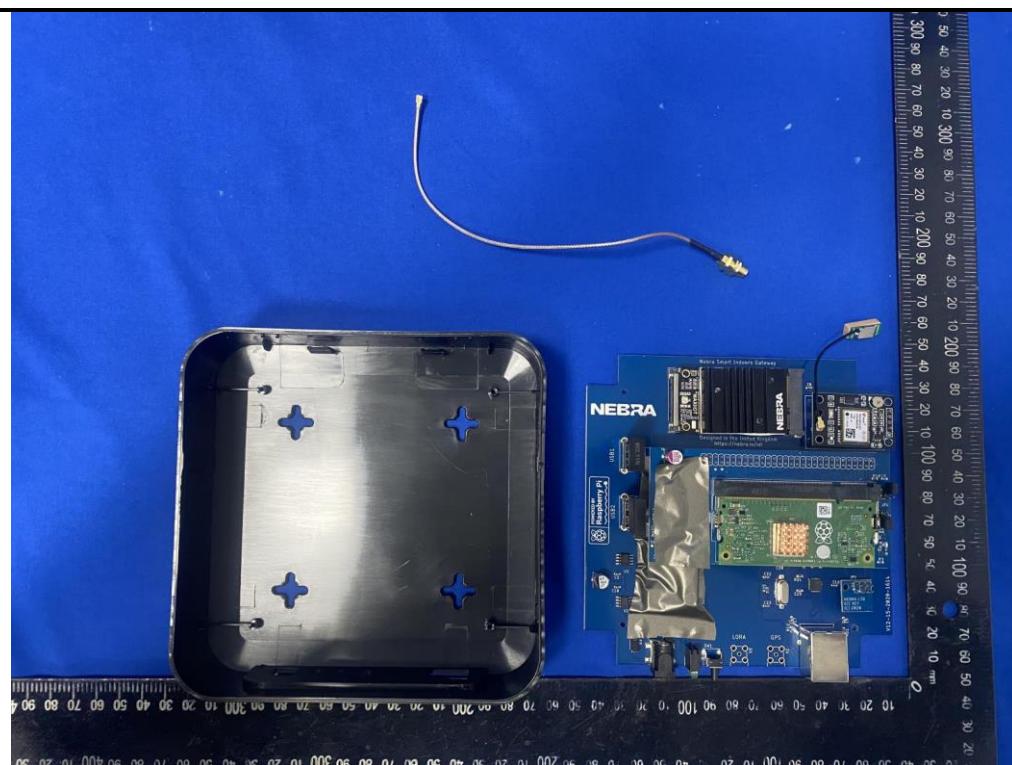


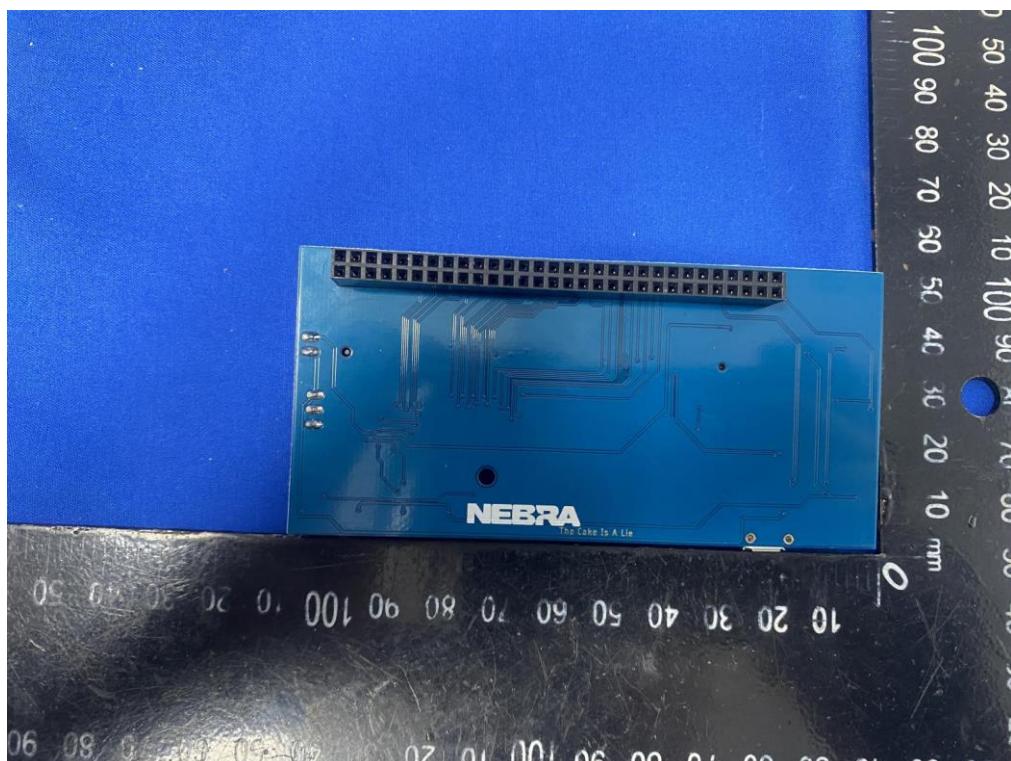
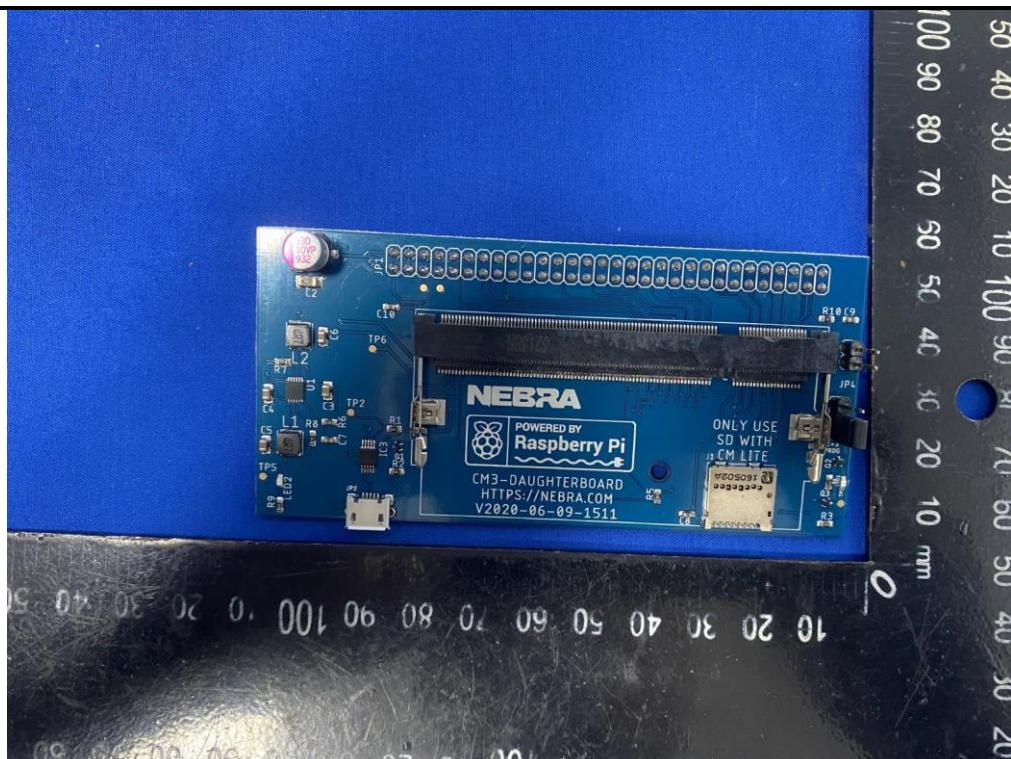


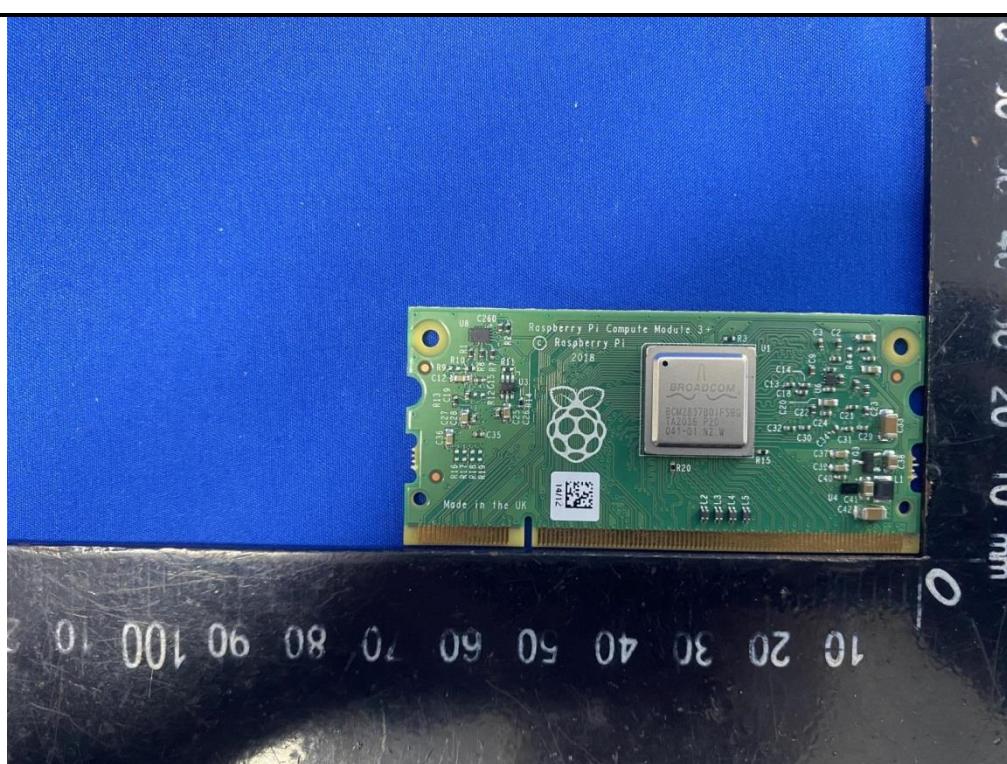


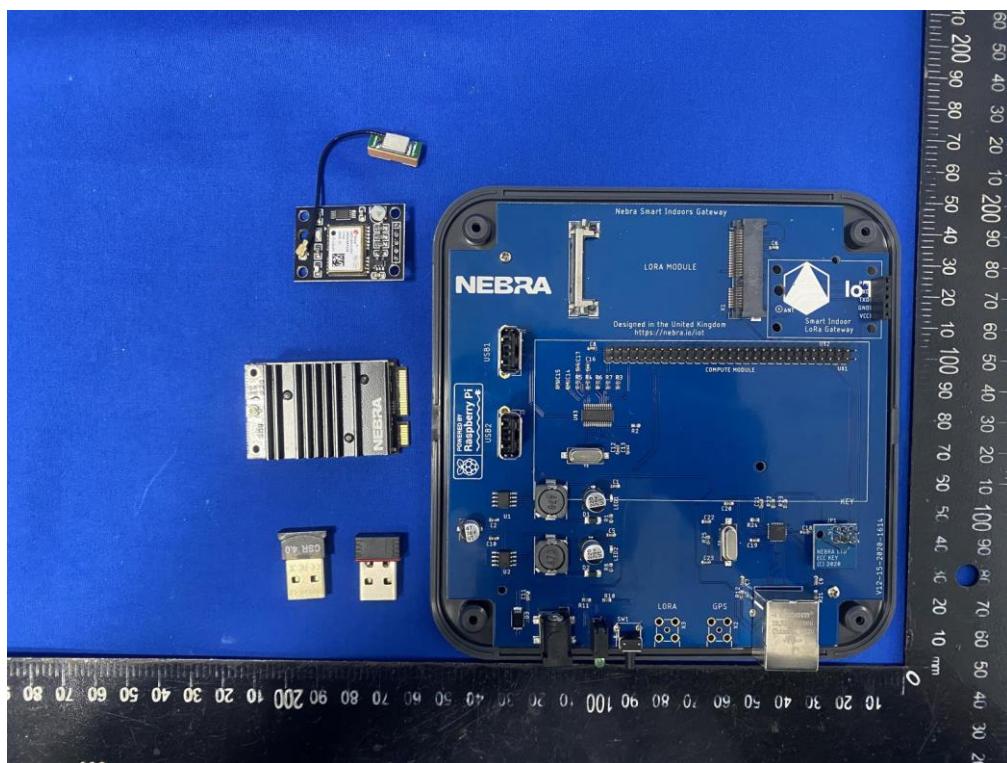
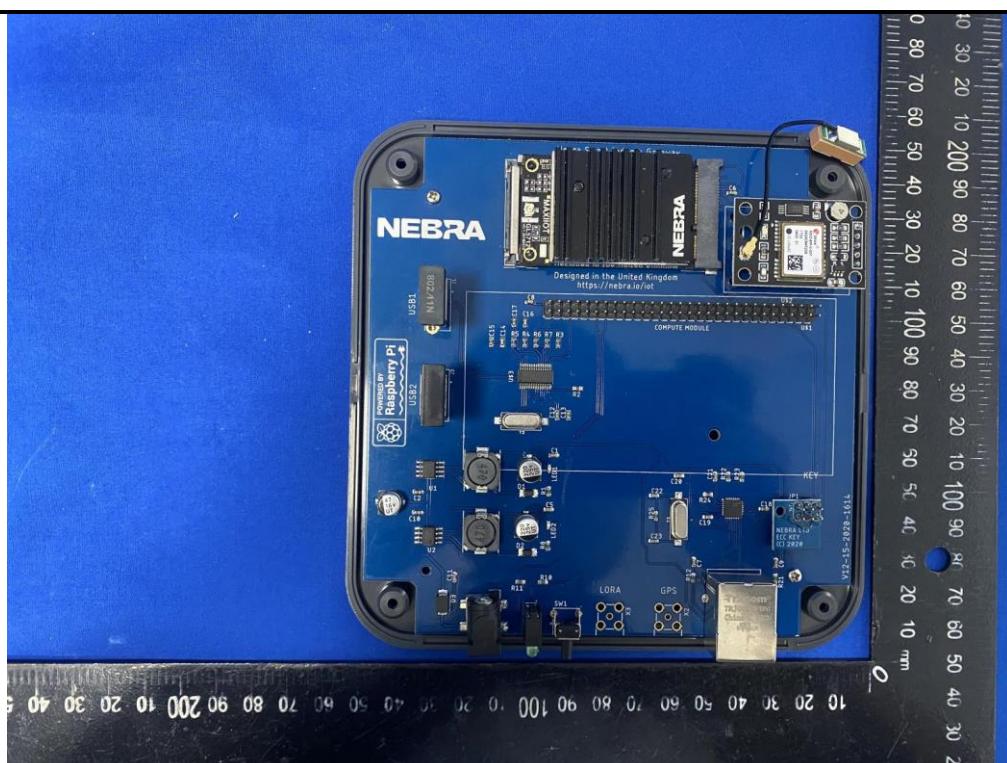


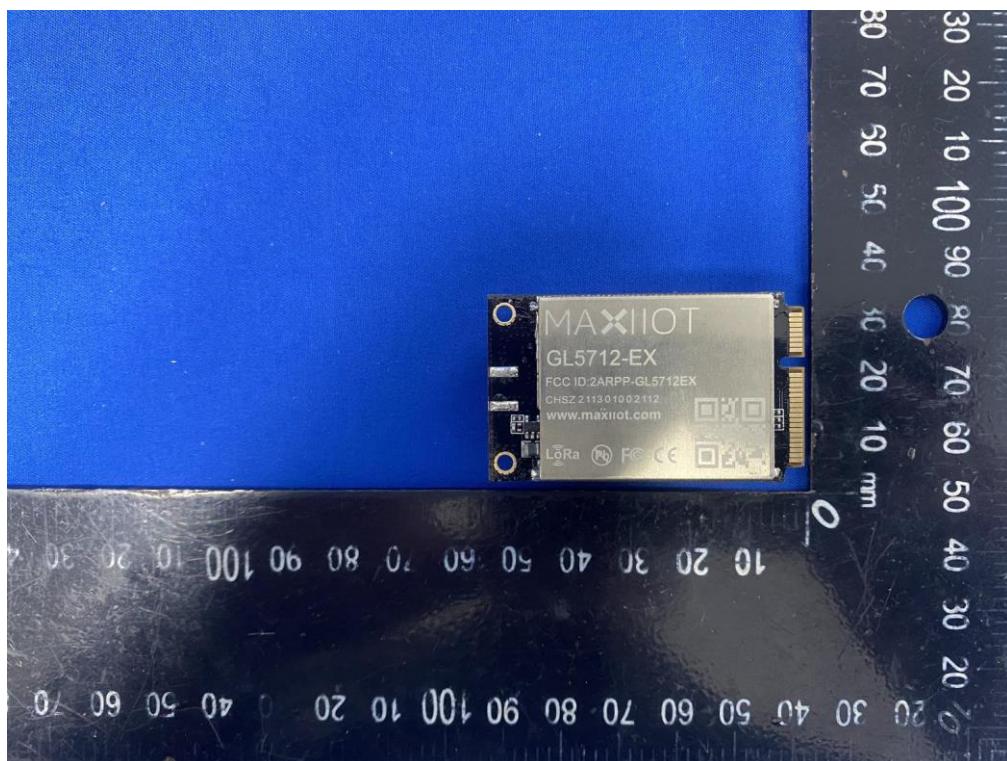
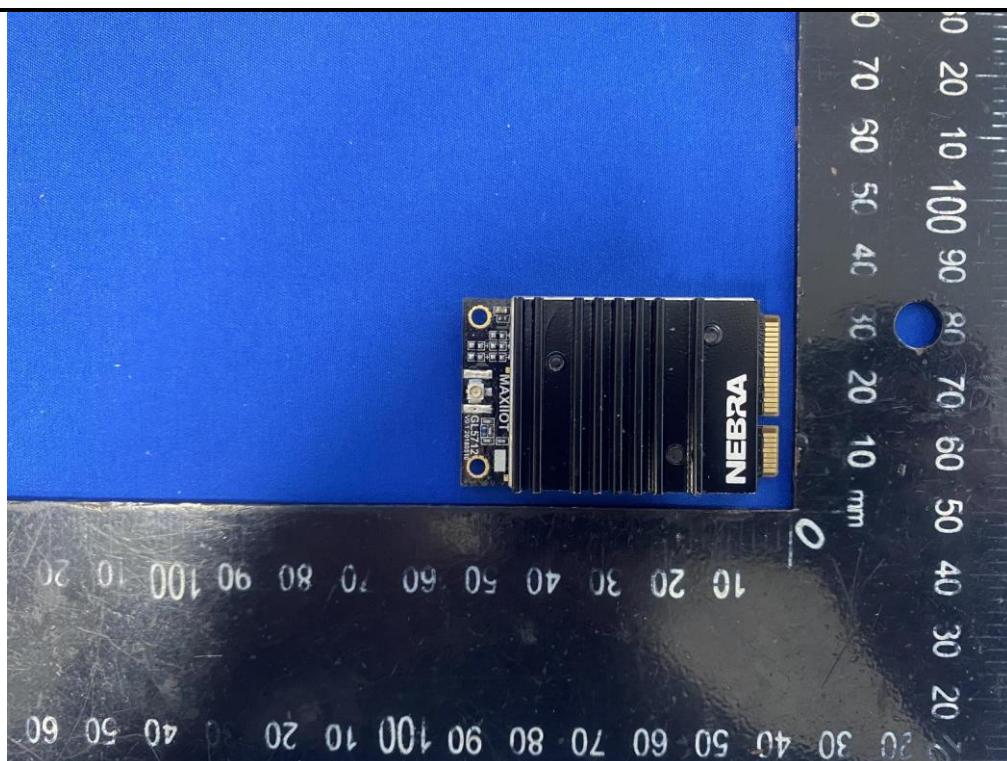


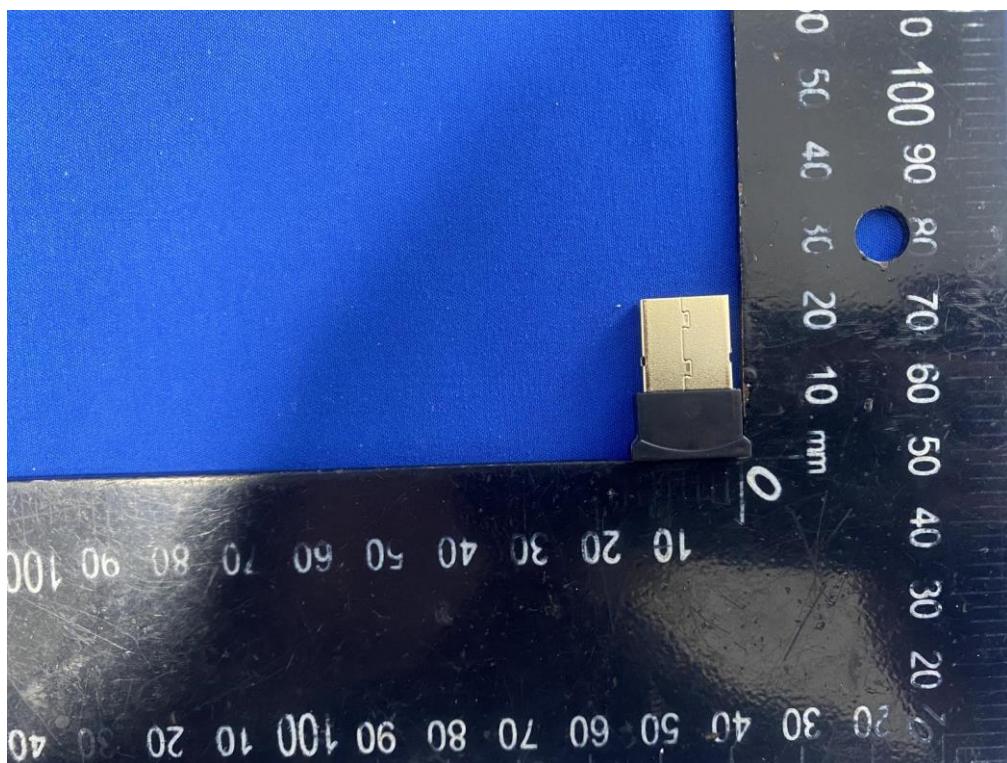
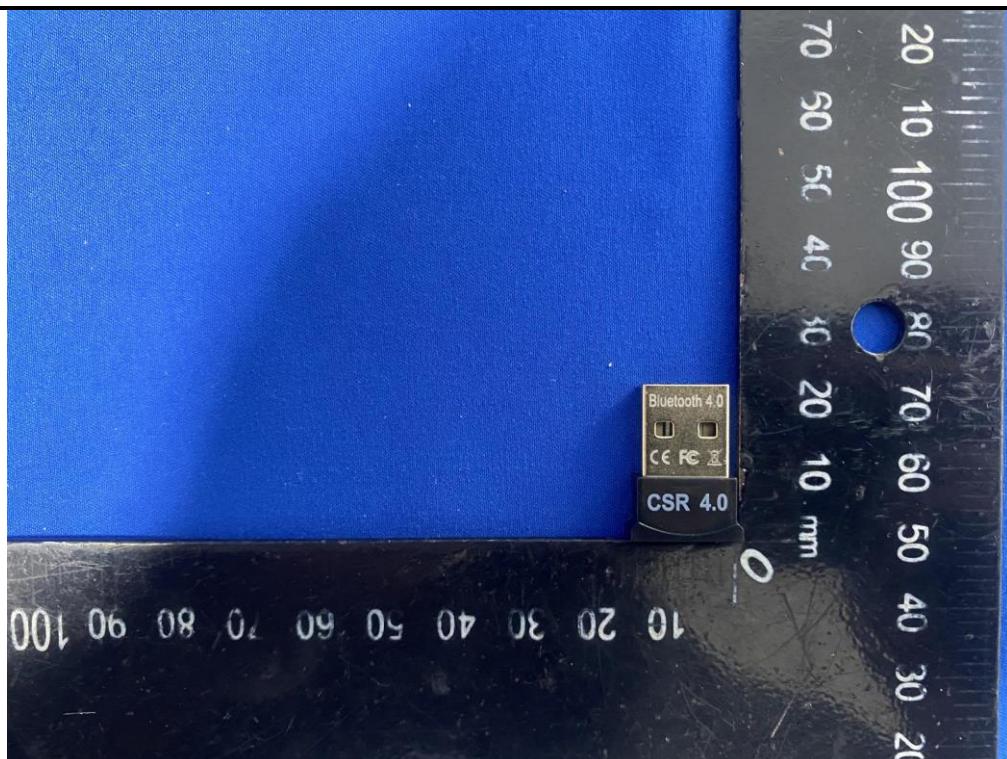


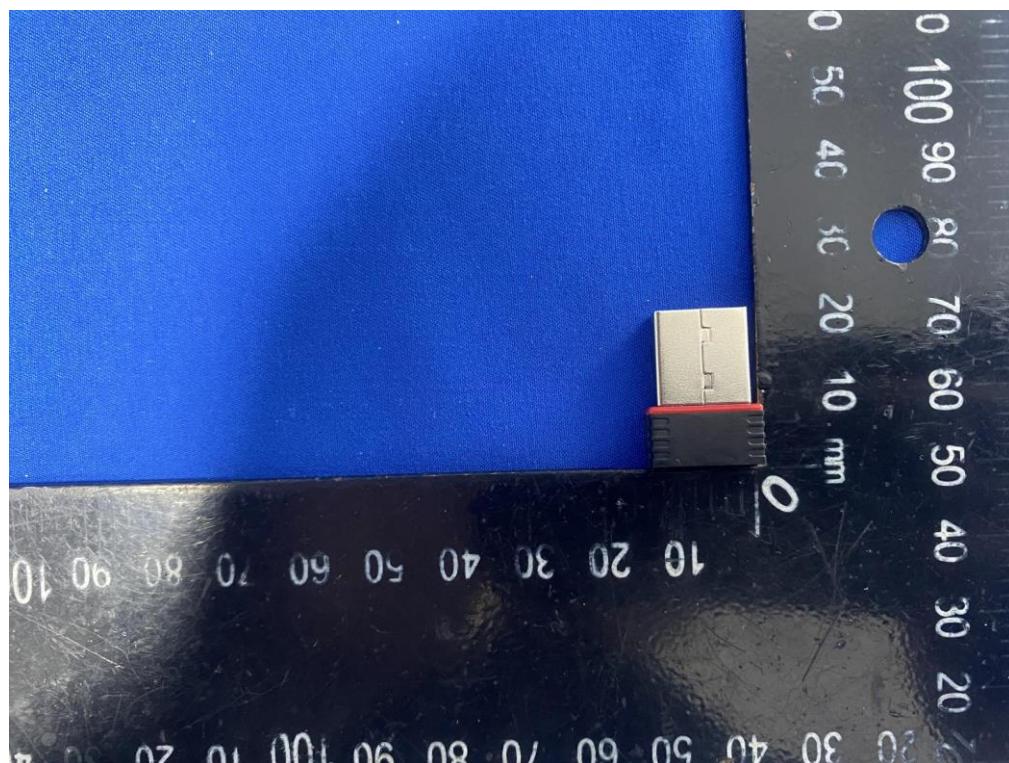
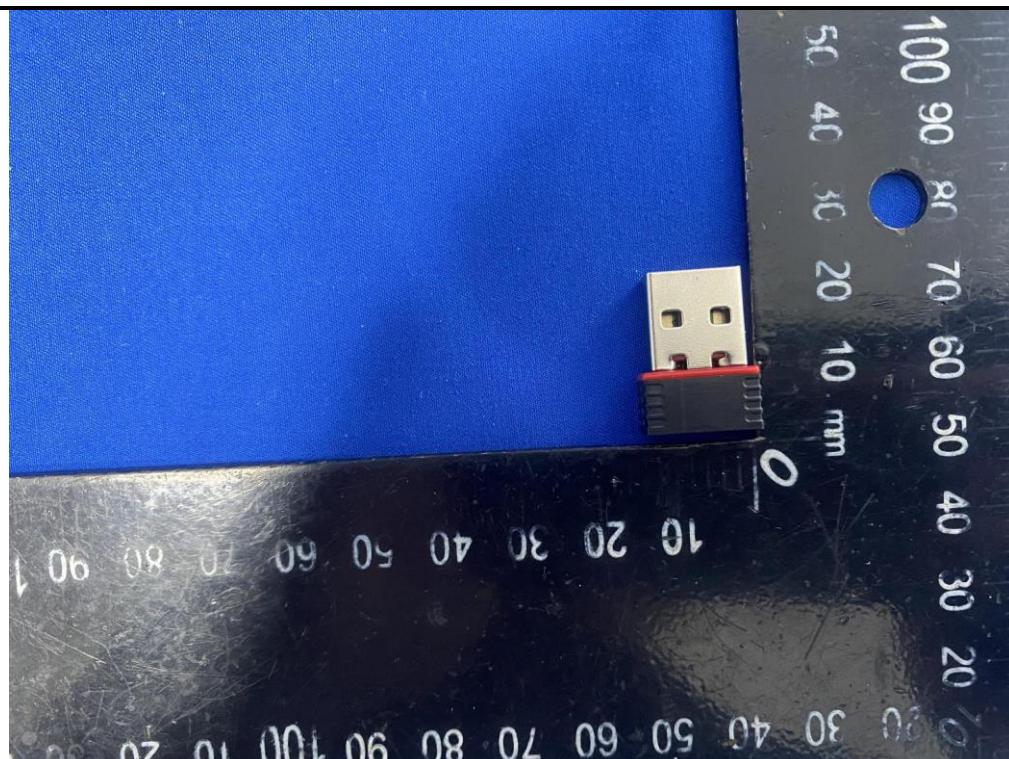


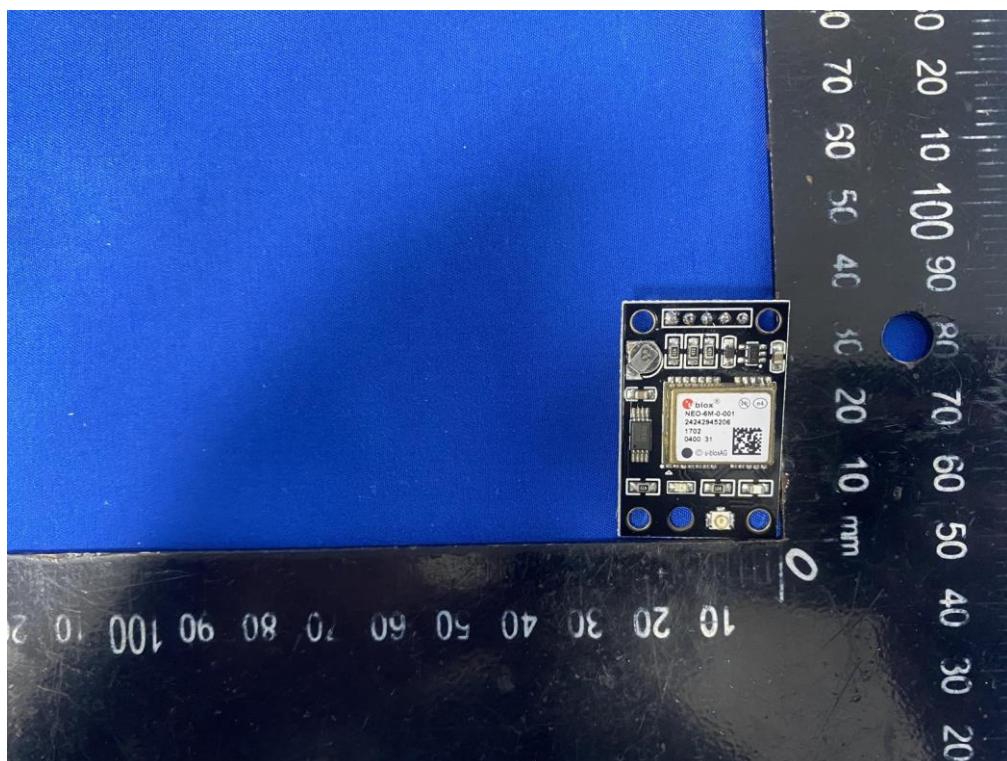
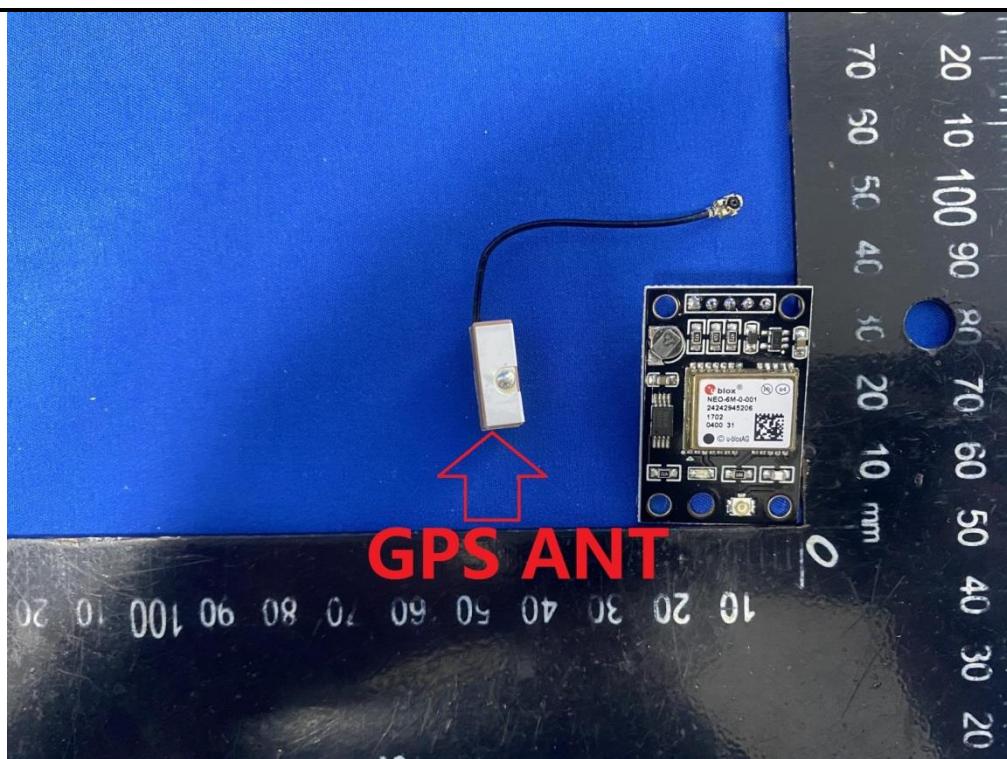


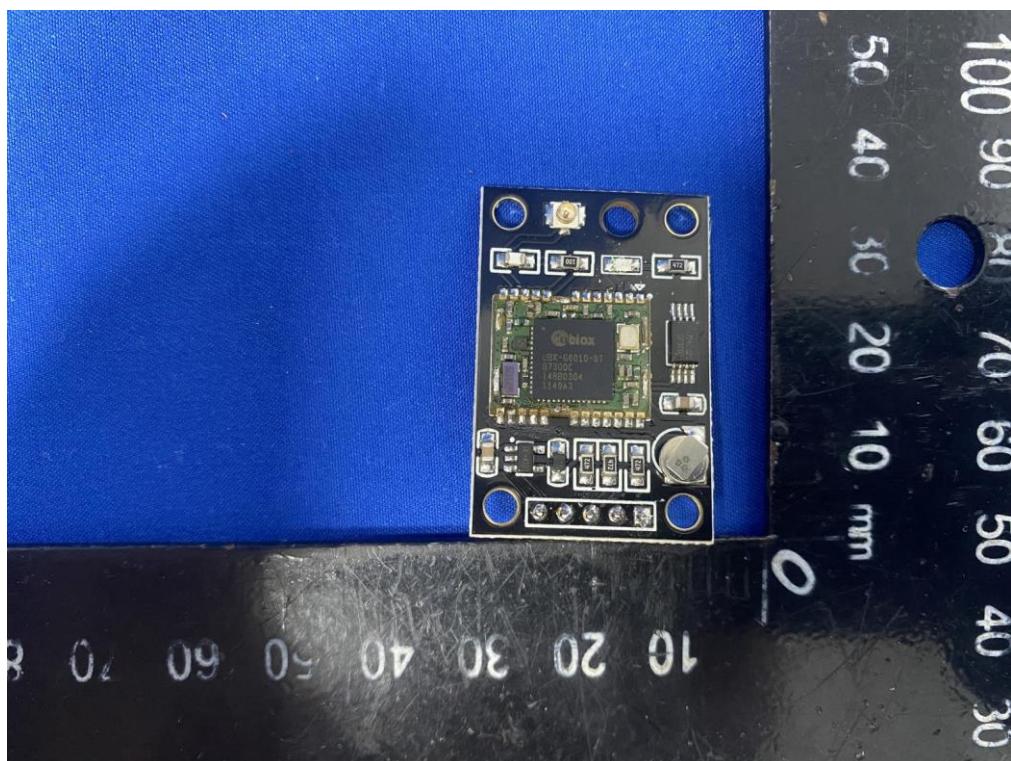
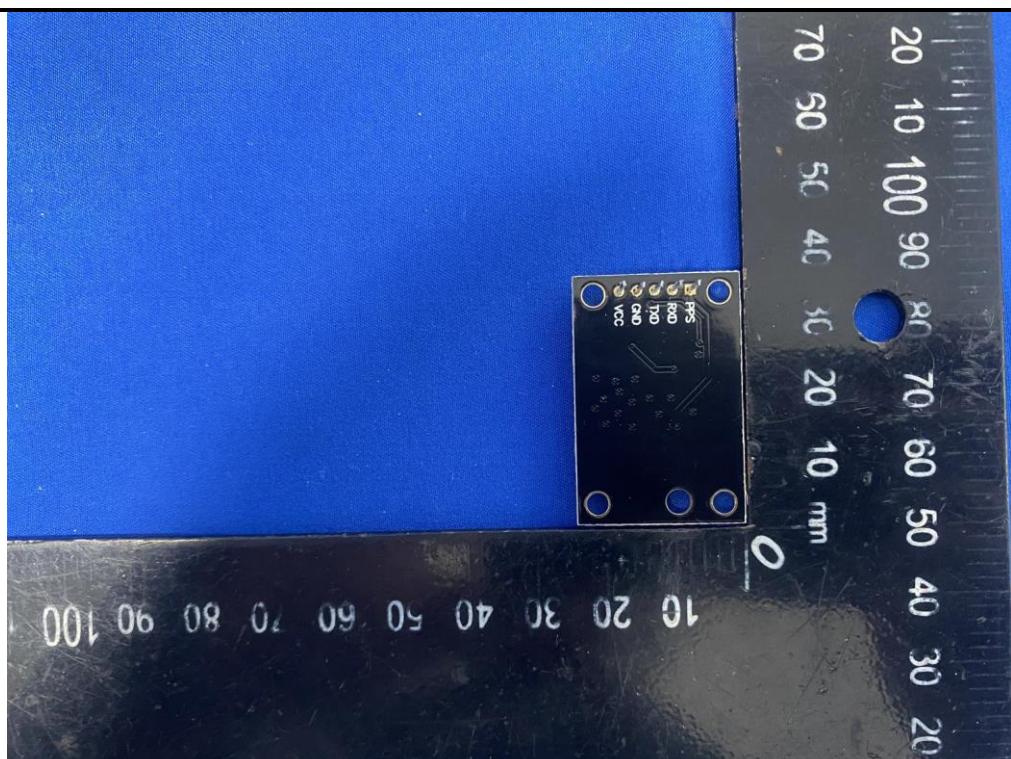


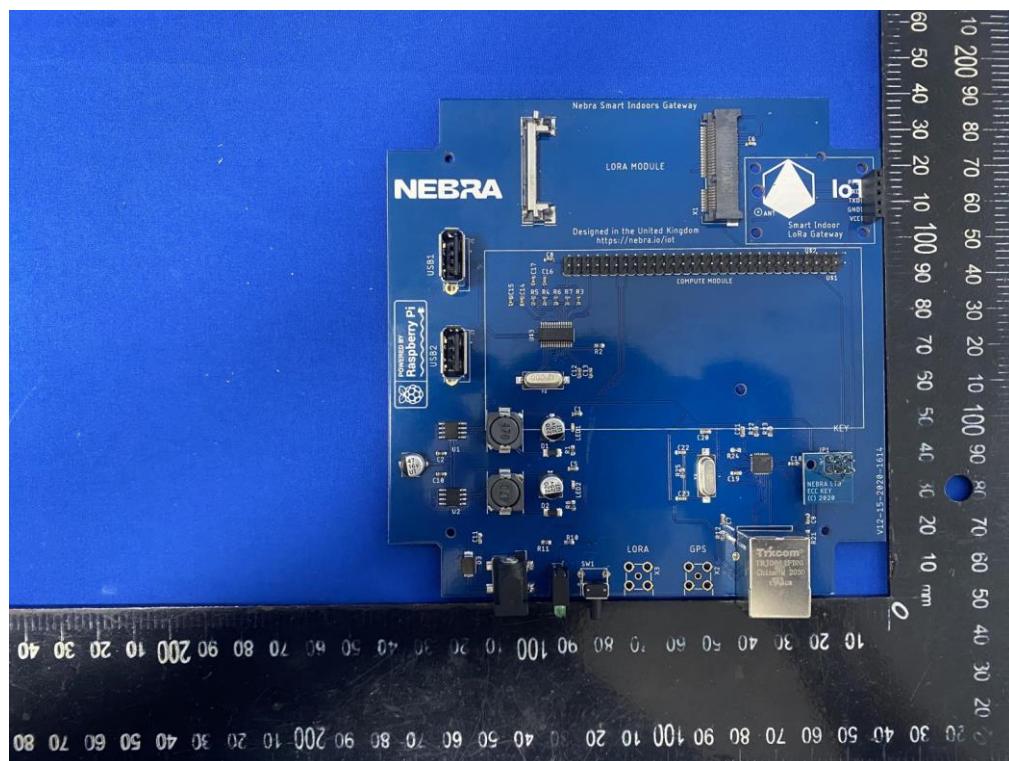


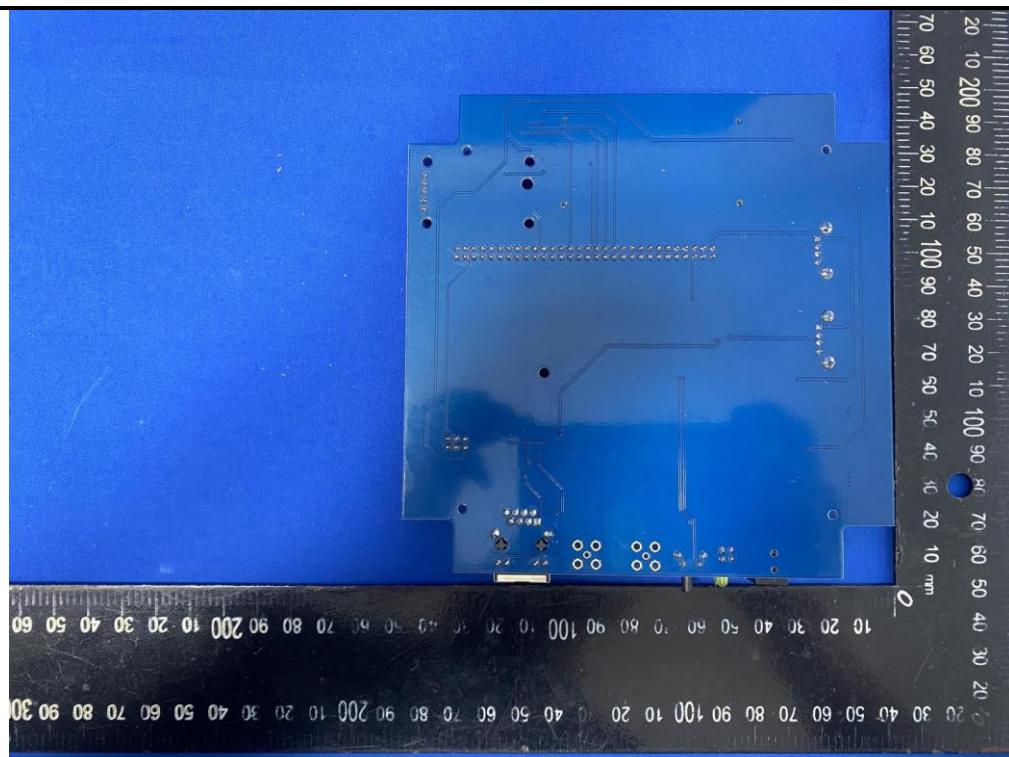


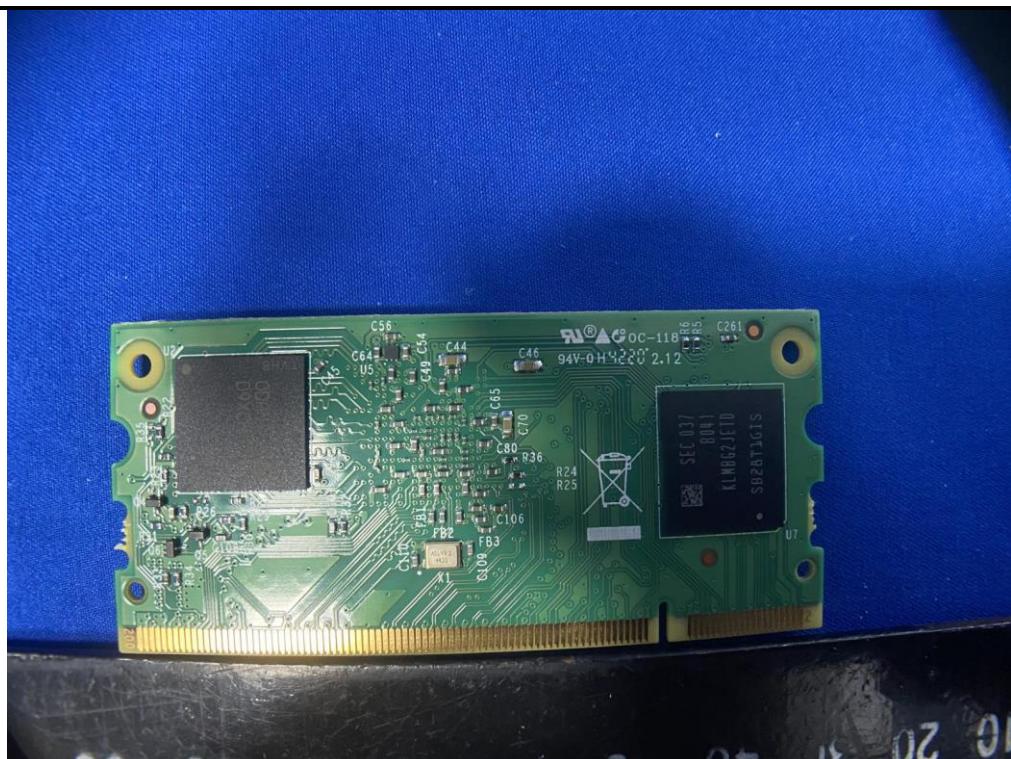


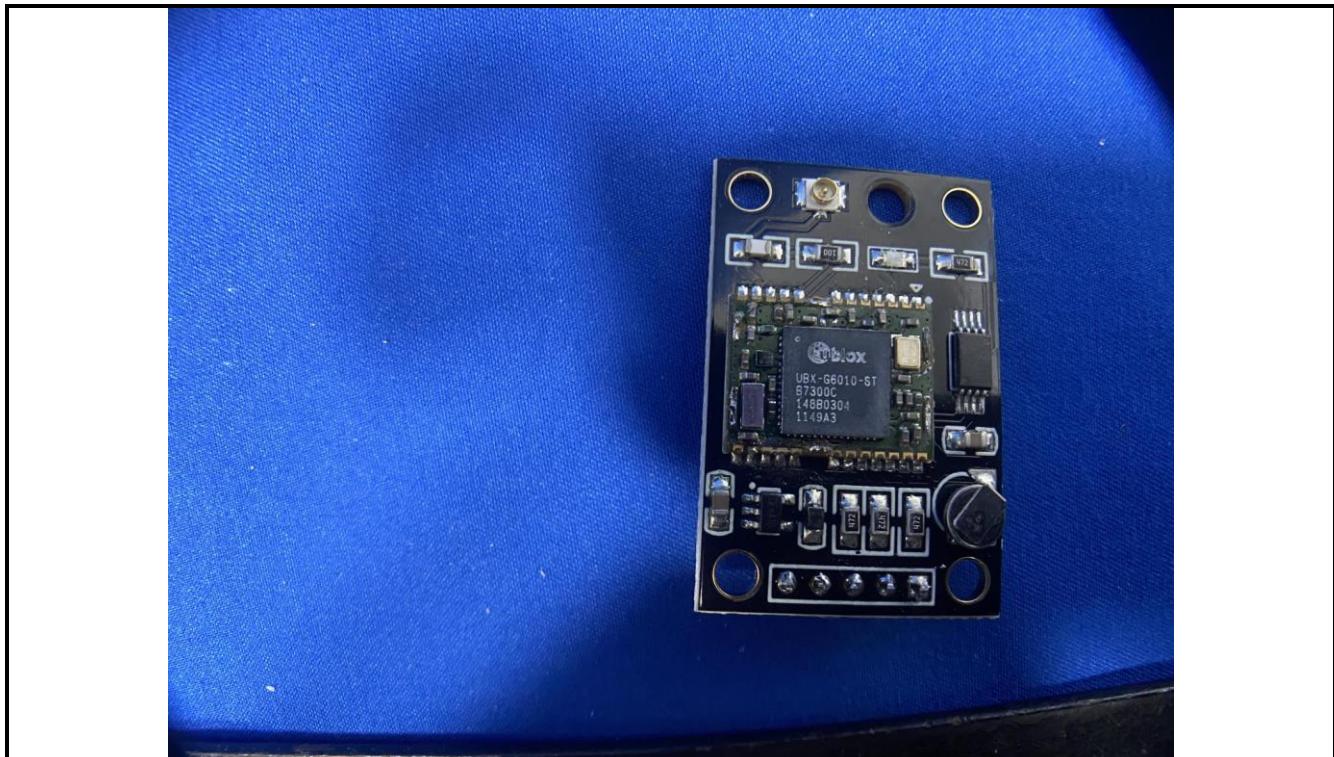












-----End of report-----