

EMC REPORT

Applicant: Nebra LTD.**Address of Applicant:** Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells TN3 9BJ United Kingdom**Equipment Under Test (EUT)**

Product Name: Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner

Model No.: HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+, HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868

Trade mark: Nebra

Applicable standards:
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)
Draft ETSI EN 301 489-52 V1.1.2 (2020-12)

Date of sample receipt: 31 May, 2021

Date of Test: 31 May, to 08 Jul., 2021

Date of report issue: 09 Jul., 2021

Test Result: PASS*

*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.

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2 Version

Version No.	Date	Description
00	09 Jul., 2021	Original

Tested by: Carey Chen
Test Engineer

Date: 09 Jul., 2021

Reviewed by: Winner Zhang
Project Engineer

Date: 09 Jul., 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	7
5.4 DESCRIPTION OF SUPPORT UNITS.....	9
5.5 MEASUREMENT UNCERTAINTY	9
5.6 DESCRIPTION OF CABLE USED.....	9
5.7 LABORATORY FACILITY	10
5.8 LABORATORY LOCATION	10
5.9 MONITORING OF EUT FOR THE IMMUNITY TEST.....	10
5.10 TEST INSTRUMENTS LIST.....	11
6 EMC REQUIREMENTS SPECIFICATION IN ETSI EN 301489	13
6.1 EMI (EMISSION)	13
6.1.1 Radiated Emission	13
6.1.2 Conducted Emissions.....	21
6.1.3 Harmonics Test Results	27
6.1.4 Flicker Test Results	27
6.2 EMS (IMMUNITY)	28
6.2.1 Electrostatic Discharge.....	31
6.2.2 RadiatedImmunity	34
7 TEST SETUP PHOTO	43
8 EUT CONSTRUCTIONAL DETAILS	49

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	N/A
Surge Immunity	ETSI EN301 489-1	EN 61000-4-5	AC port	N/A
Injected Currents	ETSI EN301 489-1	EN 61000-4-6	AC port	N/A
Voltage Dips and Interruptions	ETSI EN301 489-1	EN 61000-4-11	AC port	N/A
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 United Kingdom	
Manufacturer:	Nebra LTD.	
Address:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells TN3 9BJ United Kingdom	
Factory:	SUNSOAR TECH CO., LIMITED	
Address:	4/F, Block E, Fengze Building, Huafeng No.2 Industrial Park, Hangkong Road, XiXiang Town, BaoAn District, Shenzhen, China	

5.2 General Description of E.U.T.

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner			
Model No.:	HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+, HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868			
Tx Frequency:	2G:	GSM 900: 880MHz~915MHz	DCS 1800: 1710MHz~1785MHz	
	3G:	Band 1: 1920MHz~1980MHz	Band 8: 880MHz~915MHz	
		Band 5: 824MHz~849MHz		
	4G:	Band 1: 1920MHz~1980MHz	Band 3: 1710MHz~1785MHz	
		Band 5: 824MHz~849MHz	Band 7: 2500MHz~2570MHz	
		Band 8: 880MHz~915MHz	Band 20: 832MHz~862MHz	
		Band 28: 703MHz~748MHz	Band 38: 2570MHz~2620MHz	
Rx Frequency	2G:	2300MHz~2400MHz		
	Wi-Fi:	2412MHz~2472MHz	Bluetooth/ BLE: 2402MHz~2480MHz	
	LoRa:	868.1MHz-868.5MHz		
	2G:	GSM 900: 925MHz~960MHz	DCS 1800: 1805MHz~1880MHz	
	3G:	Band 1: 2110MHz~2170MHz	Band 8: 925MHz~960MHz	
		Band 5: 869MHz~894MHz		
	4G:	Band 1: 2110MHz~2170MHz	Band 3: 1805MHz~1880MHz	
		Band 5: 869MHz~894MHz	Band 7: 2620MHz~2690MHz	
		Band 8: 925MHz~960MHz	Band 20: 791MHz~821MHz	
		Band 28: 758MHz~803MHz	Band 38: 2570MHz~2620MHz	
		Band 40: 2300MHz~2400MHz		
	Wi-Fi:	2412MHz~2472MHz	Bluetooth/ BLE: 2402MHz~2480MHz	
	LoRa:	868.1MHz-868.5MHz	GPS: 1575.42MHz	
	Hardware version:	V01-16-2021-1820		
Software version:	4dc8745			
Modulation technology:	2G:	<input type="checkbox"/> Voice(GMSK)	<input checked="" type="checkbox"/> GPRS(GMSK)	<input checked="" type="checkbox"/> EGPRS(GMSK, 8PSK)
	3G:	<input checked="" type="checkbox"/> RCM(QPSK)	<input checked="" type="checkbox"/> HSUPA(QPSK)	<input checked="" type="checkbox"/> HSDPA(QPSK,16QAM)
	4G:	<input checked="" type="checkbox"/> QPSK	<input checked="" type="checkbox"/> 16QAM	<input type="checkbox"/> 64QAM
	Wi-Fi:	<input checked="" type="checkbox"/> 802.11b(DSSS)		<input checked="" type="checkbox"/> 802.11g/n(OFDM)
	Bluetooth:	<input checked="" type="checkbox"/> BDR(GFSK)	<input checked="" type="checkbox"/> EDR(π /4-DQPSK, 8DPSK)	<input checked="" type="checkbox"/> LE(GFSK)
	LoRa:	OOK		
Antenna Type:	External antenna & Bluetooth/BLE: PCB antenna			

Antenna Gain:	2G:	GSM900: 1.99dBi	DCS1800: 2.31dBi
	3G:	Band 1: 2.39dBi	Band 8: 1.99dBi
	4G:	Band 1: 2.39dBi	Band 3: 2.31dBi
		Band 7: 2.78dBi	Band 8: 1.99dBi
		Band 28: 1.75dBi	Band 40: 2.78dBi
	Wi-Fi: 12dBi	Bluetooth/ BLE: 2.0dBi	GPS: 3.0dBi
	LoRa: 3.0dBi		
Power supply:	AC: AC 230V / 50Hz POE: DC48V		
Remark:	Model No.: HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+, HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868 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-868 is 868 Mhz, no GPS. A unit with Model No HNTOUT-868-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.		

5.3 Test mode and test samples plans

Radiated emission
TM 1: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 2: GSM 900 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 3: DCS 1800 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 4: DCS 1800 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 5: WCDMA 2100 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link+ GPS link + Adapter
TM 6: WCDMA 2100 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 7: WCDMA 900 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter
TM 8: WCDMA 900 idle + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter
TM 9: WCDMA 850 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter
TM 10: WCDMA 850 idle + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter
TM 11: LTE FDD Band 1 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link + GPS link + Adapter
TM 12: LTE FDD Band 1 idle + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link + GPS link + Adapter
TM 13: LTE FDD Band 3 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 14: LTE FDD Band 3 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 15: LTE FDD Band 5 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 16: LTE FDD Band 5 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 17: LTE FDD Band 7 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 18: LTE FDD Band 7 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 19: LTE FDD Band 8 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 20: LTE FDD Band 8 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 21: LTE FDD Band 20 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 22: LTE FDD Band 20 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 23: LTE FDD Band 28 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 24: LTE FDD Band 28 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 25: LTE FDD Band 38 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 26: LTE FDD Band 38 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 27: LTE FDD Band 40 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 28: LTE FDD Band 40 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 29: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link +LAN link+ POE
TM 30: LAN + POE
Conducted emission
TM 1: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 2: DCS 1800 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 3: WCDMA 2100 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 4: WCDMA 900 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 5: WCDMA 850 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 6: LTE FDD Band 1 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link + GPS link + Adapter
TM 7: LTE FDD Band 3 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 8: LTE FDD Band 5 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 9: LTE FDD Band 7 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 10: LTE FDD Band 8 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 11: LTE FDD Band 20 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 12: LTE FDD Band 28 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
TM 13: LTE FDD Band 38 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 14: LTE FDD Band 40 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 15: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link +LAN link + POE

TM 16: LAN + POE

ESD

TM 1: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 2: DCS 1800 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 3: WCDMA 2100 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 4: WCDMA 900 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 5: WCDMA 850 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 6: LTE FDD Band 1 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link + GPS link + Adapter

TM 7: LTE FDD Band 3 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 8: LTE FDD Band 5 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 9: LTE FDD Band 7 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 10: LTE FDD Band 8 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 11: LTE FDD Band 20 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 12: LTE FDD Band 28 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 13: LTE FDD Band 38 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 14: LTE FDD Band 40 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 15: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link +LAN link+ POE

TM 16: LAN link + POE

RS

TM 1: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 2: GSM 900 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 3: DCS 1800 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 4: DCS 1800 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 5: WCDMA 2100 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link+ GPS link + Adapter

TM 6: WCDMA 2100 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 7: WCDMA 900 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter

TM 8: WCDMA 900 idle + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter

TM 9: WCDMA 850 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter

TM 10: WCDMA 850 idle + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link+ GPS link + Adapter

TM 11: LTE FDD Band 1 link + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link + GPS link + Adapter

TM 12: LTE FDD Band 1 idle + Wi-Fi link(2.4G Wi-Fi) + Bluetooth link + GPS link + Adapter

TM 13: LTE FDD Band 3 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 14: LTE FDD Band 3 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 15: LTE FDD Band 5 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 16: LTE FDD Band 5 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 17: LTE FDD Band 7 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 18: LTE FDD Band 7 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 19: LTE FDD Band 8 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 20: LTE FDD Band 8 idle + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 21: LTE FDD Band 20 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 22: LTE FDD Band 20 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 23: LTE FDD Band 28 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 24: LTE FDD Band 28 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter

TM 25: LTE FDD Band 38 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter

TM 26: LTE FDD Band 38 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
 TM 27: LTE FDD Band 40 link + Wi-Fi link(2.4G Wi-Fi)+ Bluetooth link + GPS link + Adapter
 TM 28: LTE FDD Band 40 idle + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link + Adapter
TM 29: GSM 900 link + Wi-Fi link(2.4G Wi-Fi)+Bluetooth link + GPS link LAN link+ POE
 TM 30: LAN + POE

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
NEBRA	Adapter	TM-K018VP-01201500PE-Z	PS1082	DoC
shenzhen gospell digital technology co.,ltd	POE	G0566-480-100	2053-000003	N/A
MERCURY	Router	MW305R	1192FPW000074	N/A
Lenovo	PC	ThinkPad E450	0B95180	DoC

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-JYTee@lets.com, Website: <http://www.ccis-cb.com>

5.9 Monitoring of EUT for the Immunity Test

Visual:	Monitored the LEDof EUT
Sound:	N/A
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
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 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

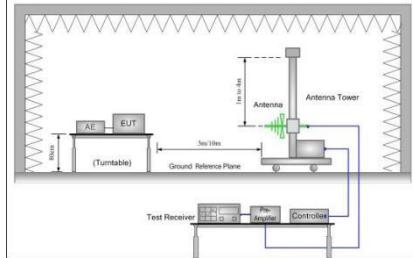
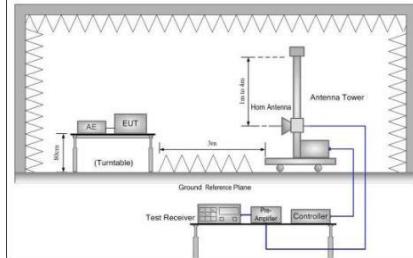
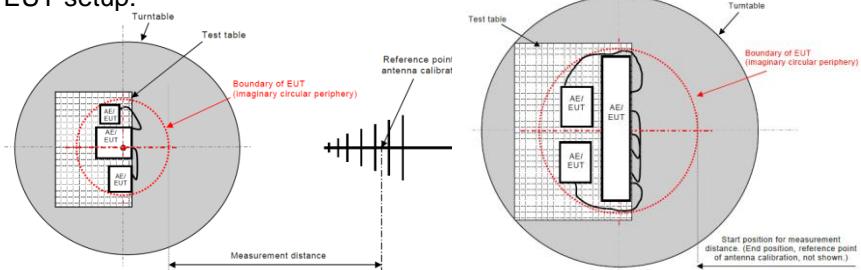
Radiated Immunity:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Signal Generator	Rohde & Schwarz	SMR20	1104.002.20	03-03-2021	03-02-2022
RF Amplifier 80M-1GHz	Amplifier Research	AR 150W1000	115243	03-03-2021	03-02-2022
RF Amplifier 1GHz-4.2GHz	Amplifier 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 Conduituning 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

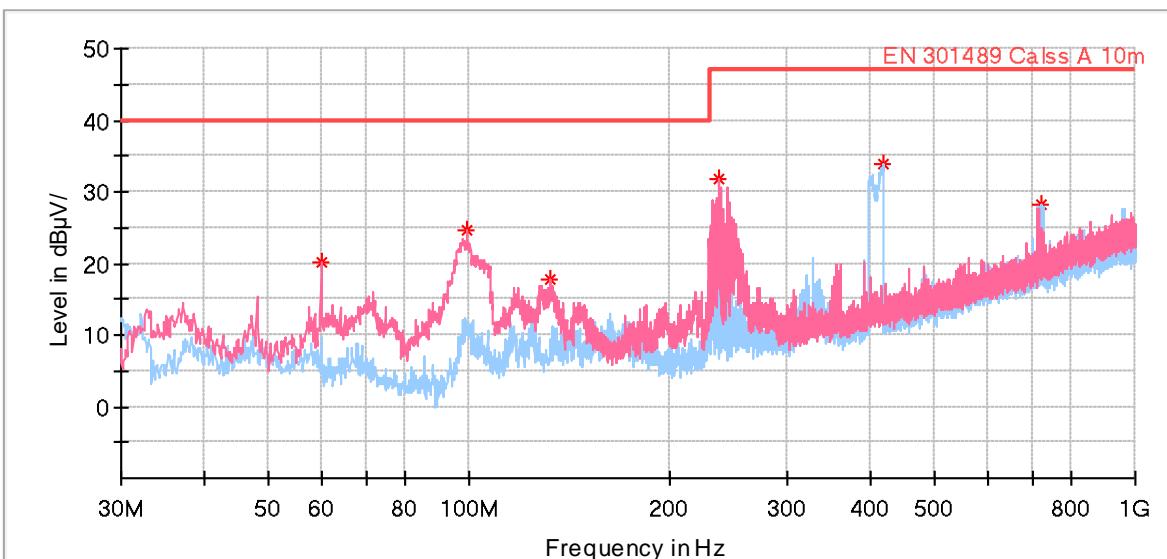
Test Requirement:	ETSI EN301 489-1								
Test Method:	EN 55032								
Test Frequency Range:	30MHz to 6GHz								
Test Distance:	3m or 10m								
Receiver setup:	Frequency	Detector	RBW	VBW	Remark				
	30MHz-1GHz	Quasi-peak	100kHz	300kHz	QP Value				
	Above 1GHz	Peak	1MHz	3MHz	PK Value				
		Average	1MHz	3MHz	AV Value				
Limit:	Frequency	Limit (dBuV/m @ 10m)		Remark					
	30MHz-230MHz	30.0		QP Value					
	230MHz-1GHz	37.0		QP Value					
	Frequency	Limit (dBuV/m @ 3m)		Remark					
	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:**AC Power supply****Below 1GHz:**

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product Model:	HNTOUT-868-G-LT+,
Test By:	Carey	Test mode:	TM 1
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	AC 230/50Hz	Environment:	Temp: 24°C Huni: 57%

Full Spectrum

**Critical_Freqs**

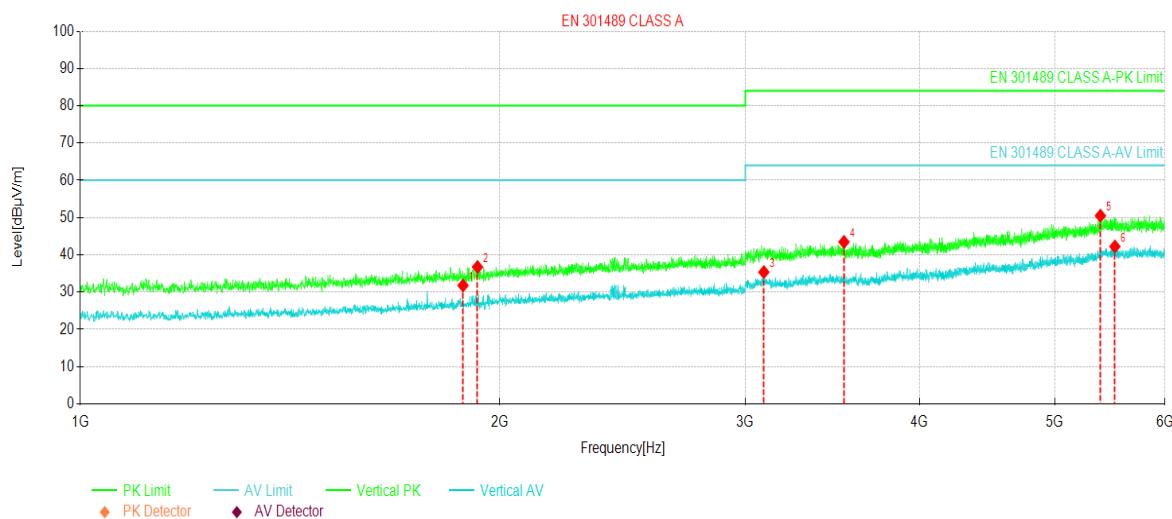
Frequency ↓ (MHz)	MaxPeak ↓ (dB μV/m)	Limit ↓ (dB μV/m)	Margin ↓ (dB)	Height ↓ (cm)	Pol	Azimuth ↓ (deg)	Corr. ↓ (dB/m)
59.973000	20.11	40.00	19.89	100.0	V	115.0	-16.3
99.452000	24.51	40.00	15.49	100.0	V	263.0	-18.9
132.044000	17.89	40.00	22.11	100.0	V	62.0	-16.2
236.416000	31.83	47.00	15.17	100.0	V	20.0	-15.9
417.709000	33.97	47.00	13.03	100.0	H	243.0	-11.2
720.155000	28.16	47.00	18.84	100.0	H	33.0	-4.7

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- The Aux Factor is a notch filter switch box loss, this item is not used.

Above 1GHz:

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product Model:	HNTOUT-868-G-LT+,
Test By:	Carey	Test mode:	TM 1
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Vertical
Test Voltage:	AC 230/50Hz	Environment:	Temp: 24°C Huni: 57%

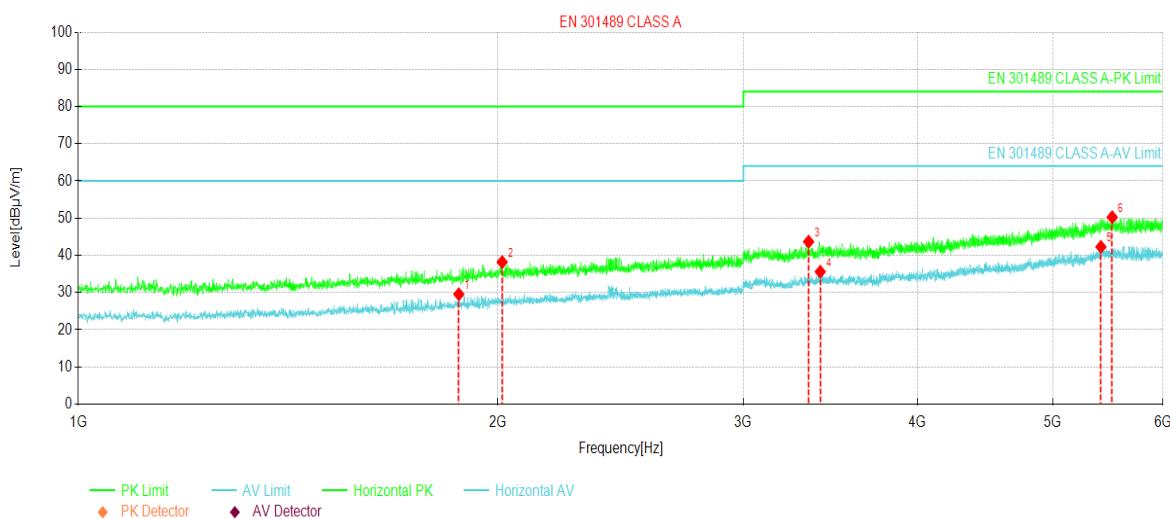


Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	1881.87	53.28	31.77	-21.51	60.00	28.23	AV	Vertical
2	1927.50	57.93	36.73	-21.20	80.00	43.27	PK	Vertical
3	3093.12	51.88	35.36	-16.52	64.00	28.64	AV	Vertical
4	3530.62	58.85	43.46	-15.39	84.00	40.54	PK	Vertical
5	5393.12	57.16	50.49	-6.67	84.00	33.51	PK	Vertical
6	5523.75	48.82	42.23	-6.59	64.00	21.77	AV	Vertical

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 Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product Model:	HNTOUT-868-G-LT+,
Test By:	Carey	Test mode:	TM 1
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
Test Voltage:	AC 230/50Hz	Environment:	Temp: 24°C Huni: 57%



Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Level [dB μ V/m]	Factor [dB]	Limit [dB μ V/m]	Margin [dB]	Trace	Polarity
1	1875.00	51.09	29.54	-21.55	60.00	30.46	AV	Horizontal
2	2014.37	58.78	38.18	-20.60	80.00	41.82	PK	Horizontal
3	3341.25	59.64	43.67	-15.97	84.00	40.33	PK	Horizontal
4	3406.25	51.35	35.59	-15.76	64.00	28.41	AV	Horizontal
5	5415.00	48.88	42.27	-6.61	64.00	21.73	AV	Horizontal
6	5516.87	56.83	50.24	-6.59	84.00	33.76	PK	Horizontal

Remark:

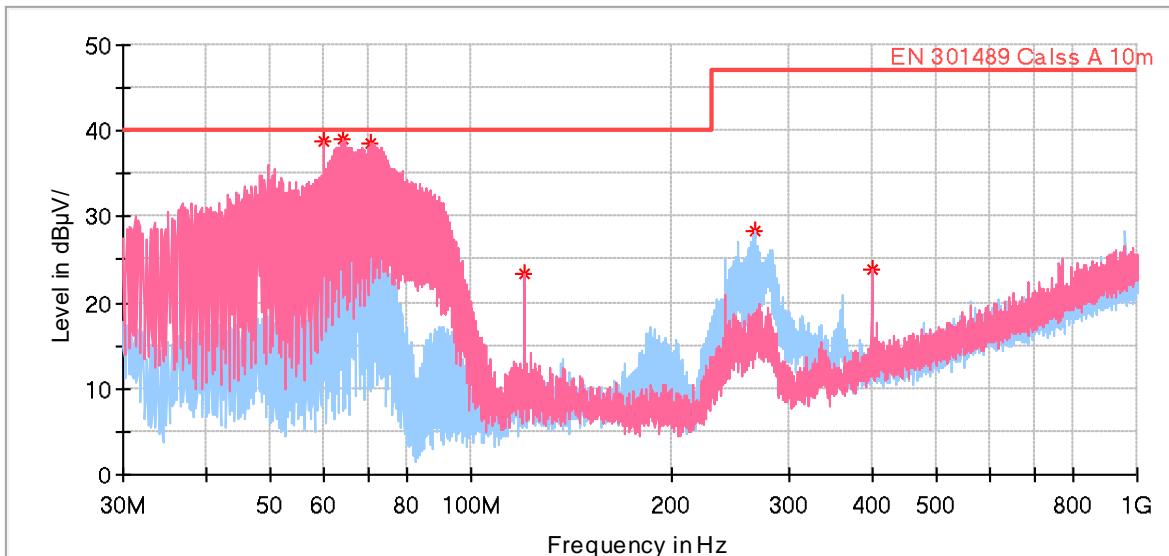
- Final Level = Receiver Read level + Antenna Factor + Cable Loss + Aux Factor – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

POE Power supply

Below 1GHz:

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product Model:	HNTOUT-868-G-LT+,
Test By:	Carey	Test mode:	TM 29
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	AC 230/50Hz	Environment:	Temp: 24°C Huni: 57%

Full Spectrum

Critical_Freqs

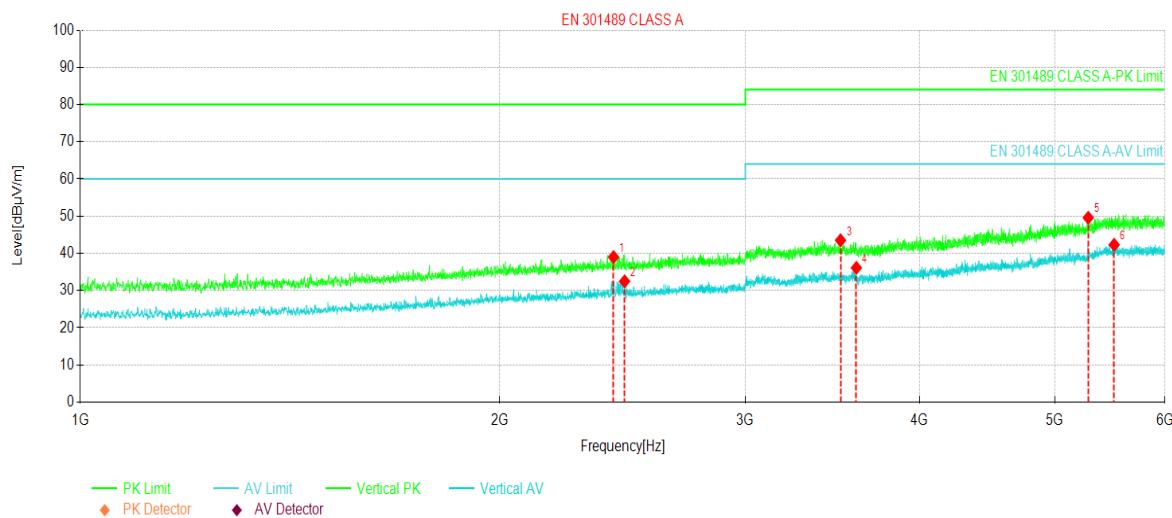
Frequency ↓ (MHz)	MaxPeak ↓ (dB μ V/m)	Limit ↓ (dB μ V/m)	Margin ↓ (dB)	Height ↓ (cm)	Pol.	Azimuth ↓ (deg)	Corr. ↓ (dB/m)
59.973000	38.77	40.00	1.23	100.0	V	213.0	-16.3
64.241000	38.97	40.00	1.03	100.0	V	295.0	-17.2
70.546000	38.64	40.00	1.36	100.0	V	311.0	-18.4
120.016000	23.40	40.00	16.60	100.0	V	33.0	-17.1
266.777000	28.24	47.00	18.76	100.0	H	112.0	-15.3
398.988000	23.76	47.00	23.24	100.0	V	266.0	-11.0

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- The Aux Factor is a notch filter switch box loss, this item is not used.

Above 1GHz:

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product Model:	HNTOUT-868-G-LT+,
Test By:	Carey	Test mode:	TM 29
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Vertical
Test Voltage:	AC 230/50Hz	Environment:	Temp: 24°C Huni: 57%

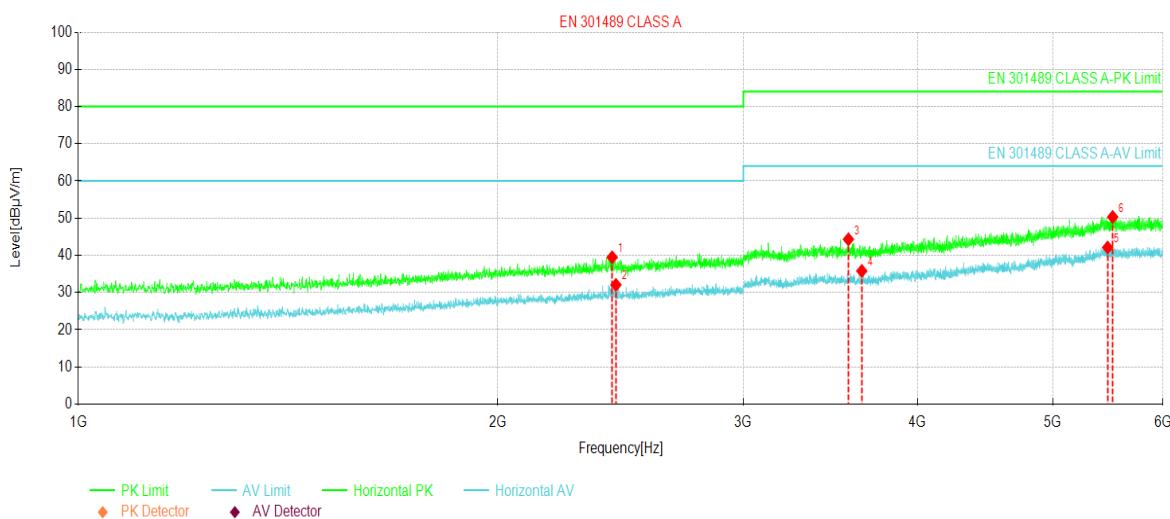


Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	2413.12	58.35	39.00	-19.35	80.00	41.00	PK	Vertical
2	2457.50	51.76	32.49	-19.27	60.00	27.51	AV	Vertical
3	3510.62	58.90	43.51	-15.39	84.00	40.49	PK	Vertical
4	3603.75	51.48	36.11	-15.37	64.00	27.89	AV	Vertical
5	5285.62	57.14	49.58	-7.56	84.00	34.42	PK	Vertical
6	5516.87	48.90	42.31	-6.59	64.00	21.69	AV	Vertical

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 Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product Model:	HNTOUT-868-G-LT+,
Test By:	Carey	Test mode:	TM 29
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
Test Voltage:	AC 230/50Hz	Environment:	Temp: 24°C Huni: 57%



Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Level [dB μ V/m]	Factor [dB]	Limit [dB μ V/m]	Margin [dB]	Trace	Polarity
1	2415.62	58.82	39.48	-19.34	80.00	40.52	PK	Horizontal
2	2430.62	51.38	32.06	-19.32	60.00	27.94	AV	Horizontal
3	3568.75	59.69	44.31	-15.38	84.00	39.69	PK	Horizontal
4	3648.12	51.02	35.80	-15.22	64.00	28.20	AV	Horizontal
5	5475.62	48.70	42.11	-6.59	64.00	21.89	AV	Horizontal
6	5521.25	56.90	50.31	-6.59	84.00	33.69	PK	Horizontal

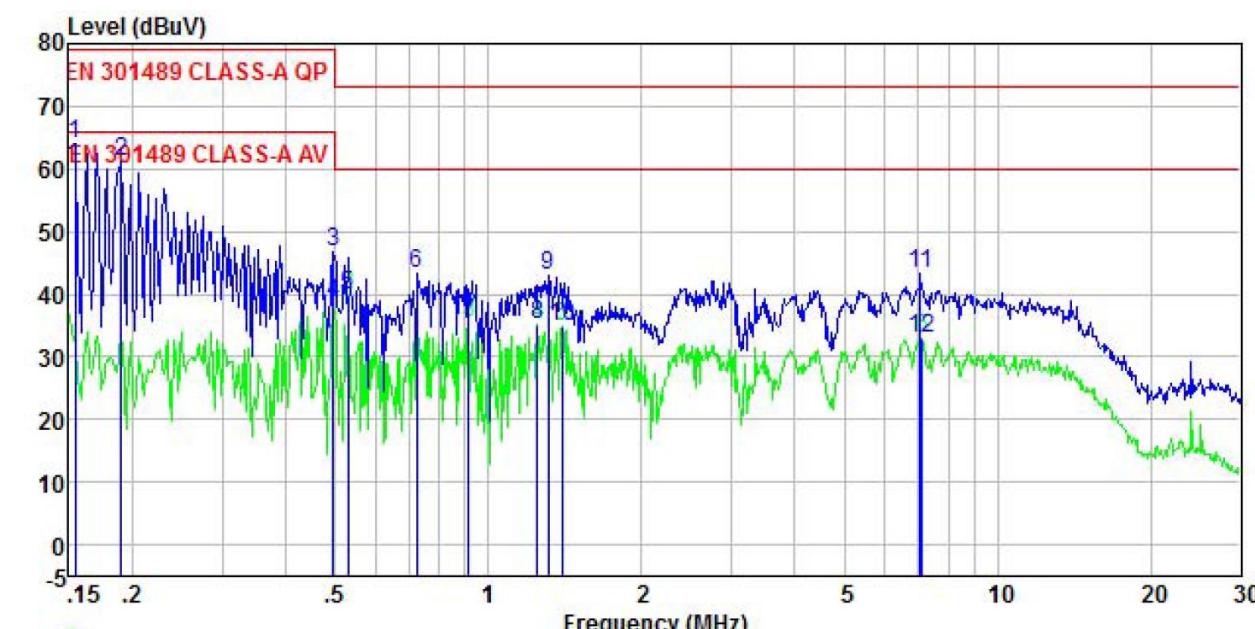
Remark:

- 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.

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 style="text-align: center;">Reference Plane</p> <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		

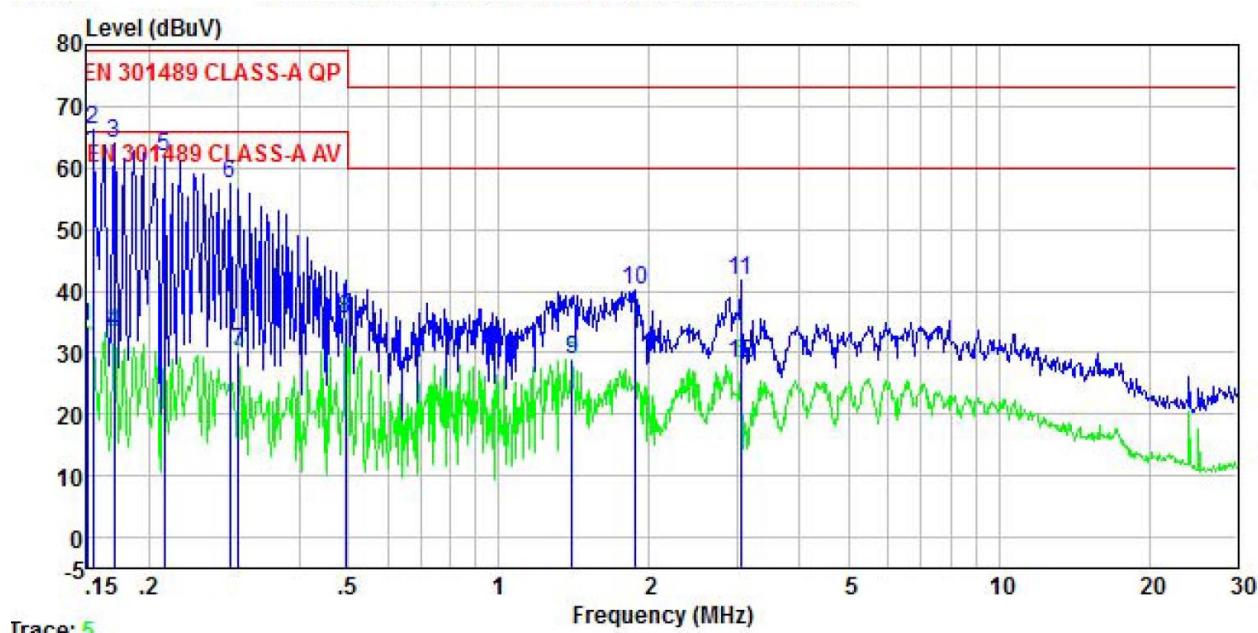
Measurement Data:**AC Power supply**

Product name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product model:	HNTOUT-868-G-LT+,					
Test by:	Carey	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 Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.154	53.93	10.12	-0.06	0.01	64.00	79.00	-15.00 QP
2	0.190	51.11	10.14	-0.14	0.03	61.14	79.00	-17.86 QP
3	0.497	36.62	10.34	-0.32	0.03	46.67	79.00	-32.33 QP
4	0.497	28.55	10.34	-0.32	0.03	38.60	66.00	-27.40 Average
5	0.529	29.89	10.35	-0.36	0.03	39.91	60.00	-20.09 Average
6	0.724	33.12	10.42	-0.32	0.03	43.25	73.00	-29.75 QP
7	0.914	24.60	10.46	0.24	0.04	35.34	60.00	-24.66 Average
8	1.249	24.38	10.50	0.21	0.10	35.19	60.00	-24.81 Average
9	1.310	32.19	10.50	0.16	0.11	42.96	73.00	-30.04 QP
10	1.396	24.04	10.51	0.08	0.13	34.76	60.00	-25.24 Average
11	7.062	31.00	10.73	1.34	0.10	43.17	73.00	-29.83 QP
12	7.100	20.80	10.73	1.34	0.10	32.97	60.00	-27.03 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 Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product model:	HNTOUT-868-G-LT+,
Test by:	Carey	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%



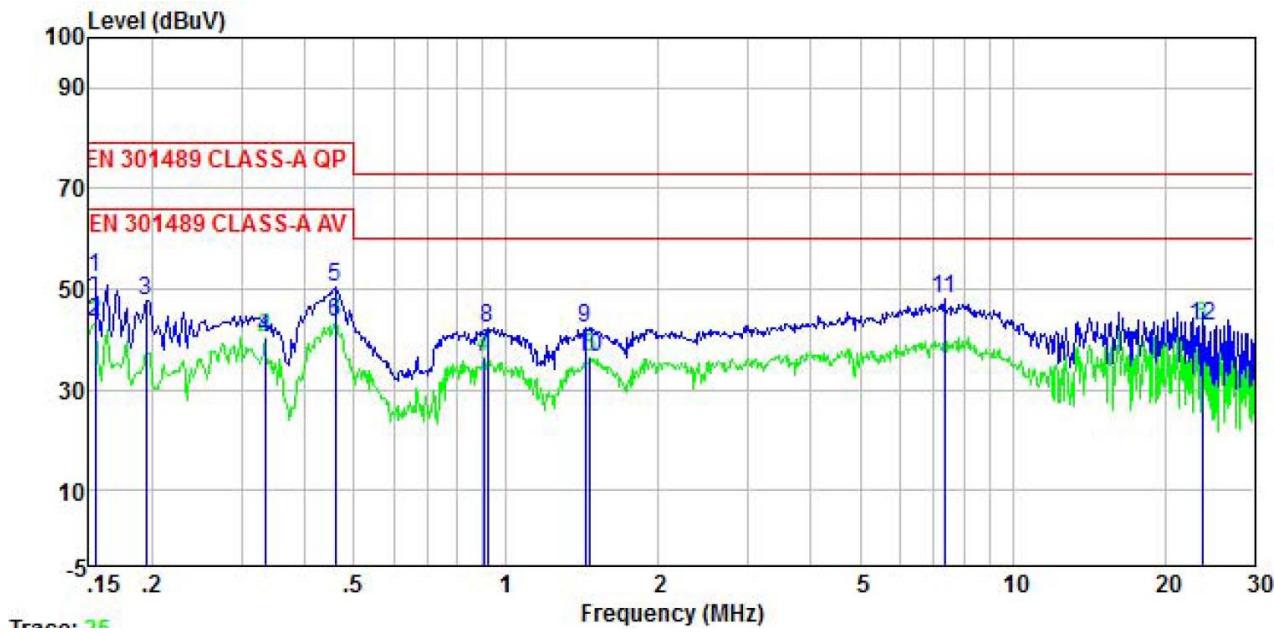
Freq	Read	LISN	Aux	Cable	Limit	Over	Remark
	Level	Factor	Factor	Loss			
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB
1	0.150	24.44	9.89	0.01	0.01	34.35	66.00 -31.65 Average
2	0.154	56.27	9.89	0.01	0.01	66.18	79.00 -12.82 QP
3	0.170	54.22	9.90	0.01	0.01	64.14	79.00 -14.86 QP
4	0.170	23.38	9.90	0.01	0.01	33.30	66.00 -32.70 Average
5	0.214	51.91	9.94	0.00	0.03	61.88	79.00 -17.12 QP
6	0.289	47.46	10.00	0.01	0.03	57.50	79.00 -21.50 QP
7	0.302	20.07	10.01	0.01	0.03	30.12	66.00 -35.88 Average
8	0.494	25.09	10.20	0.03	0.03	35.35	66.00 -30.65 Average
9	1.403	18.06	10.68	0.12	0.13	28.99	60.00 -31.01 Average
10	1.878	29.13	10.78	0.16	0.19	40.26	73.00 -32.74 QP
11	3.041	30.37	10.90	0.32	0.07	41.66	73.00 -31.34 QP
12	3.041	16.99	10.90	0.32	0.07	28.28	60.00 -31.72 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.

POE Power supply

Product name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product model:	HNTOUT-868-G-LT+,
Test by:	Carey	Test mode:	TM 15
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 230 V/50 Hz	Environment:	Temp: 22.5°C Huni: 55%

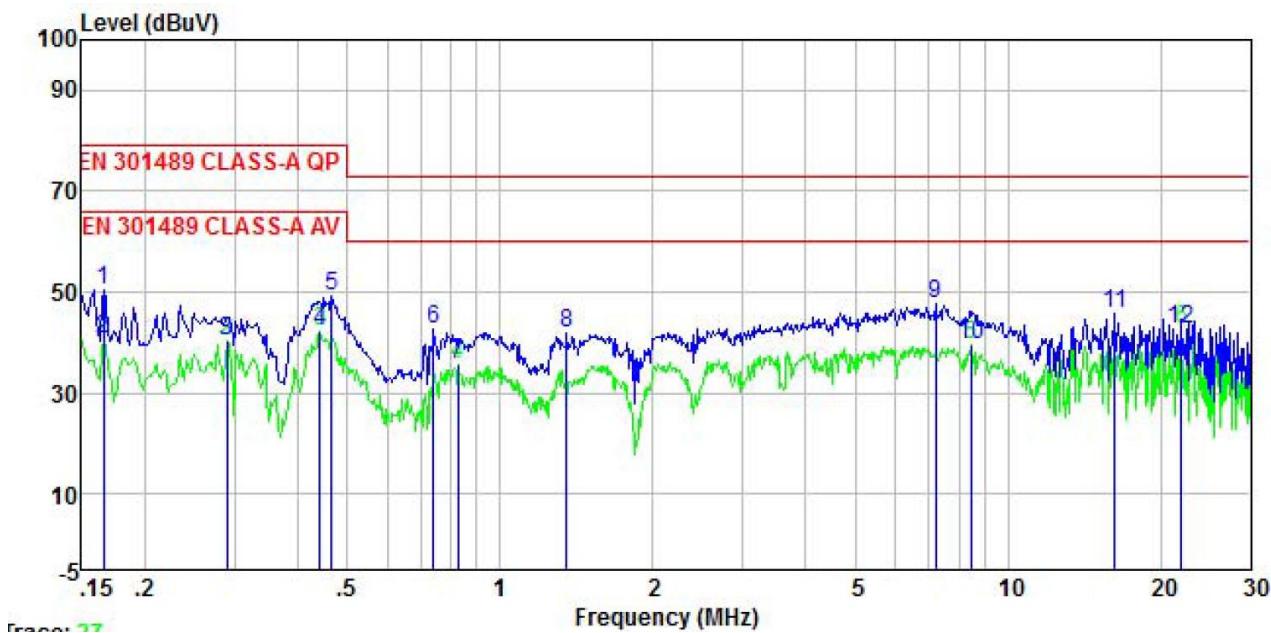


Freq	Read	LISN	Aux	Cable	Limit Line	Over Line	Remark
	MHz	dBuV	Factor	Factor			
1	0.154	42.45	10.12	-0.06	0.01	52.52	79.00 -26.48 QP
2	0.154	33.47	10.12	-0.06	0.01	43.54	66.00 -22.46 Average
3	0.194	37.77	10.14	-0.15	0.03	47.79	79.00 -31.21 QP
4	0.334	30.04	10.24	-0.01	0.02	40.29	66.00 -25.71 Average
5	0.459	39.98	10.32	-0.06	0.03	50.27	79.00 -28.73 QP
6	0.459	33.23	10.32	-0.06	0.03	43.52	66.00 -22.48 Average
7	0.904	25.94	10.46	0.21	0.04	36.65	60.00 -23.35 Average
8	0.918	31.55	10.46	0.24	0.04	42.29	73.00 -30.71 QP
9	1.433	31.65	10.51	0.06	0.13	42.35	73.00 -30.65 QP
10	1.464	25.86	10.51	0.03	0.14	36.54	60.00 -23.46 Average
11	7.329	35.72	10.74	1.40	0.10	47.96	73.00 -25.04 QP
12	23.636	30.20	11.24	0.96	0.17	42.57	60.00 -17.43 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 Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product model:	HNTOUT-868-G-LT+,
Test by:	Carey	Test mode:	TM 15
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 230 V/50 Hz	Environment:	Temp: 22.5°C Huni: 55%

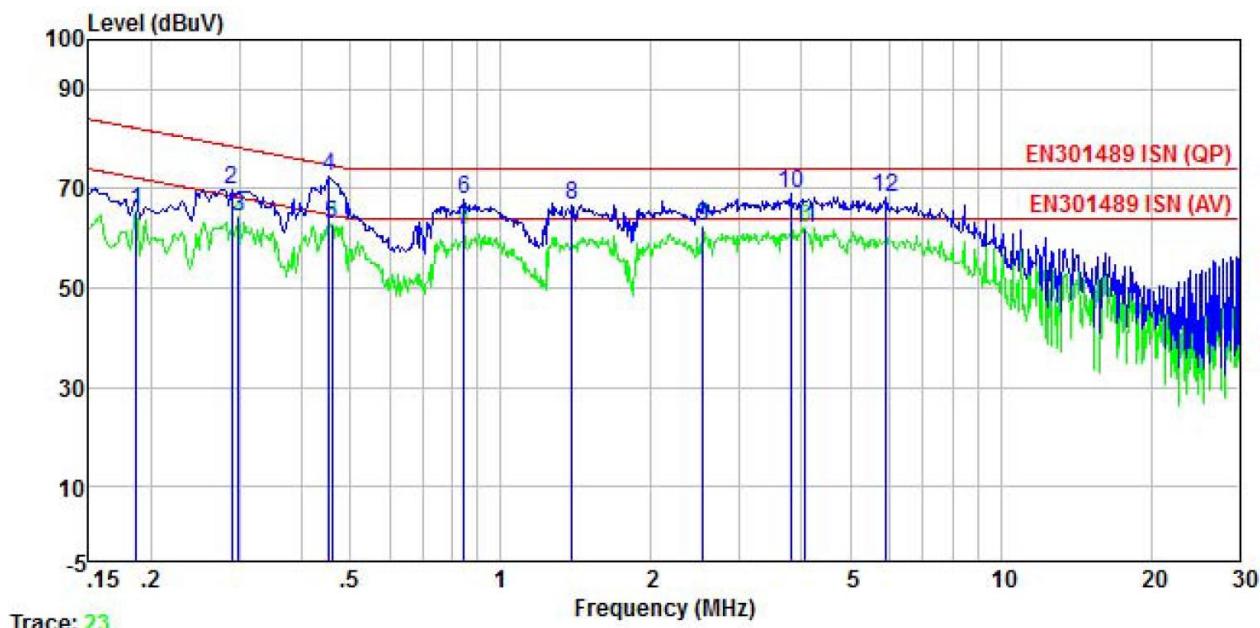


Freq MHz	Read Level dBuV	LISN Factor dB	Aux Factor dB	Cable Loss dB	Limit Line dBuV	Over Line dB	Remark
	MHz	dBuV	dB	dB	dBuV	dB	
1	0.166	40.53	9.90	0.01	50.45	79.00	-28.55 QP
2	0.166	30.70	9.90	0.01	40.62	66.00	-25.38 Average
3	0.289	30.41	10.00	0.01	40.45	66.00	-25.55 Average
4	0.442	32.17	10.15	-0.02	42.33	66.00	-23.67 Average
5	0.466	38.92	10.18	0.00	49.13	79.00	-29.87 QP
6	0.739	32.14	10.40	0.05	42.62	73.00	-30.38 QP
7	0.826	25.03	10.46	0.06	35.58	60.00	-24.42 Average
8	1.352	30.84	10.66	0.12	41.74	73.00	-31.26 QP
9	7.213	35.43	11.11	0.88	47.52	73.00	-25.48 QP
10	8.456	27.20	11.17	1.13	39.60	60.00	-20.40 Average
11	16.226	31.60	11.45	2.38	45.59	73.00	-27.41 QP
12	21.946	30.26	11.67	0.43	42.52	60.00	-17.48 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 Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	Product model:	HNTOUT-868-G-LT+,
Test by:	Carey	Test mode:	TM 16
Test frequency:	150 kHz ~ 30 MHz	Phase:	/
Test voltage:	AC 230 V/50 Hz	Environment:	Temp: 22.5°C Huni: 55%



Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
MHz	dBuV			dB	dBuV	dBuV	dB	
1	0.186	55.13	10.23	0.00	0.02	65.38	72.20	-6.82 Average
2	0.289	59.64	10.05	0.00	0.03	69.72	78.54	-8.82 QP
3	0.299	54.37	10.04	0.00	0.03	64.44	68.28	-3.84 Average
4	0.454	62.45	9.89	0.00	0.03	72.37	74.80	-2.43 QP
5	0.459	53.03	9.88	0.00	0.03	62.94	64.71	-1.77 Average
6	0.844	57.99	9.75	0.00	0.04	67.78	74.00	-6.22 QP
7	0.844	51.90	9.75	0.00	0.04	61.69	64.00	-2.31 Average
8	1.388	57.30	9.43	0.00	0.13	66.86	74.00	-7.14 QP
9	2.540	53.04	9.37	0.00	0.13	62.54	64.00	-1.46 Average
10	3.799	59.11	9.64	0.00	0.08	68.83	74.00	-5.17 QP
11	4.070	52.31	9.66	0.00	0.08	62.05	64.00	-1.95 Average
12	5.898	58.56	9.75	0.00	0.09	68.40	74.00	-5.60 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 301 489-1/3/17/19/52: 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 301 489-1/3/17/19/52: 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 301 489-1/3/17/19/52, sub clause 6

Criteria	Performance Criteria of EN 301 489-1 clause 6
CT/CR	<p>During the test, the equipment shall:</p> <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	<p>For all ports and transient phenomena with the exception described below, the following applies:</p> <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. <p>For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:</p> <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 ETSI EN 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.
Criteria	Performance Criteria of EN 301 489-52 clause 6
CT	<p>A communication link shall be established at the start of the test, and maintained during the test, see clauses 4.2.3 and 4.2.4.</p> <p>During the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).</p> <p>NOTE: When there is a high level background noise present the filter bandwidth can be reduced down to a minimum of 40 Hz.</p> <p>At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.</p>
TT	<p>A communications link shall be established at the start of the test, see appropriate clauses 4.2 to 4.2.4.</p> <p>At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.</p> <p>At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.</p> <p>In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.</p>
CR	<p>A communications link shall be established at the start of the test, see appropriate clauses 4.2 to 4.2.6.</p> <p>During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.</p> <p>During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).</p> <p>NOTE: When there is a high level background noise present the filter bandwidth can be reduced down to a minimum of 40 Hz.</p> <p>At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained.</p>
TR	<p>A communications link shall be established at the start of the test, see appropriate clauses 4.2 to 4.2.6.</p> <p>At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.</p> <p>At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.</p>

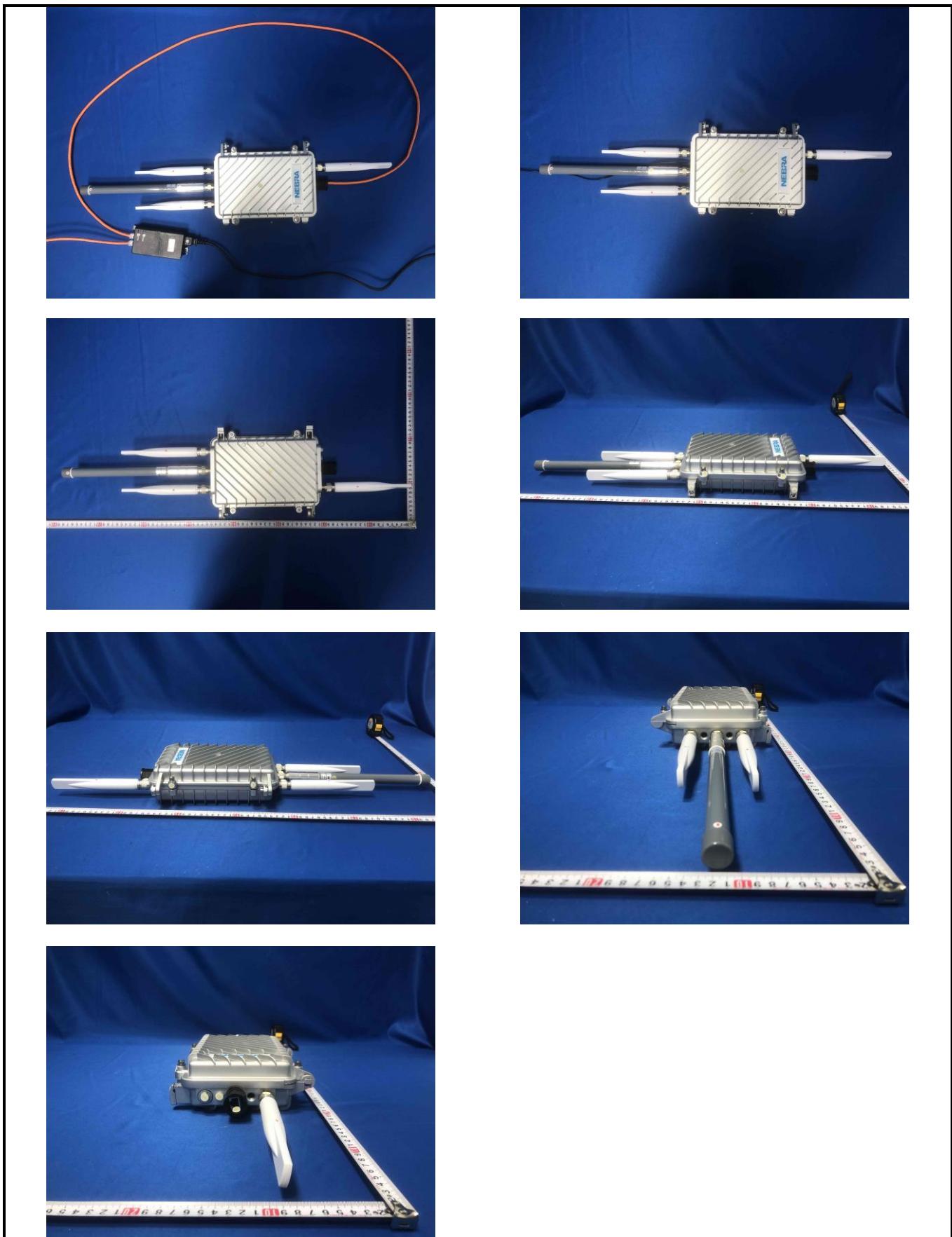
6.2.1 Electrostatic Discharge

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

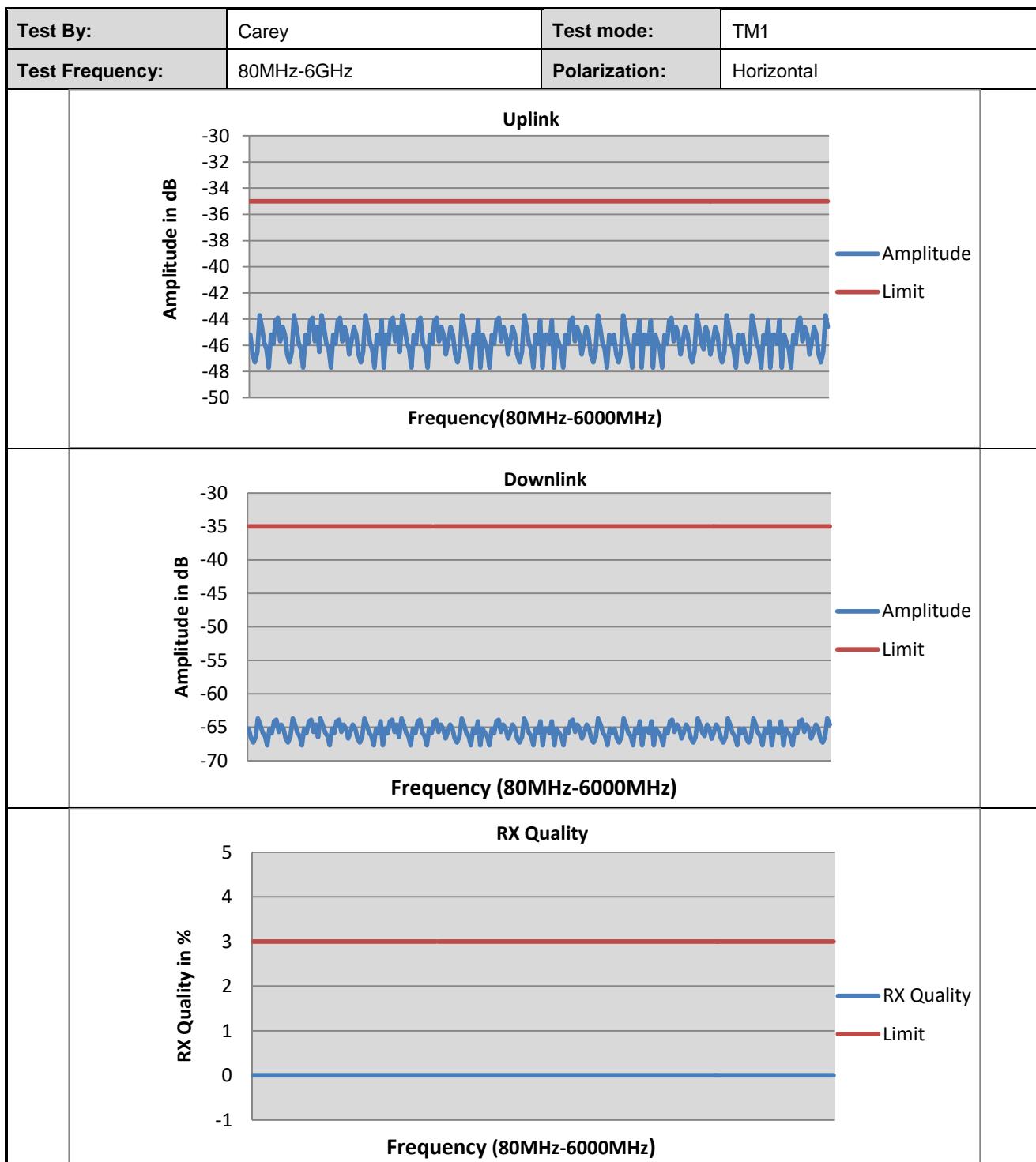
Frequency	Level	Modulation	Antenna Polarization	EUT Face	Observations (Performance Criterion)	Result
80MHz-6GHz	3V/m	1kHz, 80% Amp. Mod, 1% increment, dwell time=3seconds	V H V H V H V H V H V H	Front Rear Left Right Top Bottom	CT/CR	Pass
Remark:	1. Pre-test all EUT face, and just the worst case face (Rear) was shown in report. 2. Transmitter exclusion band: The exclusion band for transmitters and transmitter sections of transceivers is the band of frequencies over which no immunity tests with radiated RF are made. The exclusion band for transmitters extends three times the channel separation ($3 \times 200 \text{ kHz} = 600 \text{ kHz}$) centred on the nominal operating frequency of the transmitter. 3. Receiver and receivers of duplex transceivers exclusion band: The exclusion band for receivers and receiver sections of transceivers is the band of frequencies over which no immunity tests with radiated RF are made. The lower frequency of the exclusion band is the lower frequency of the receive band of the EUT minus 6 % of that frequency. The upper frequency of the exclusion band is the upper frequency of the receive band of the EUT plus 5 % of that frequency.					

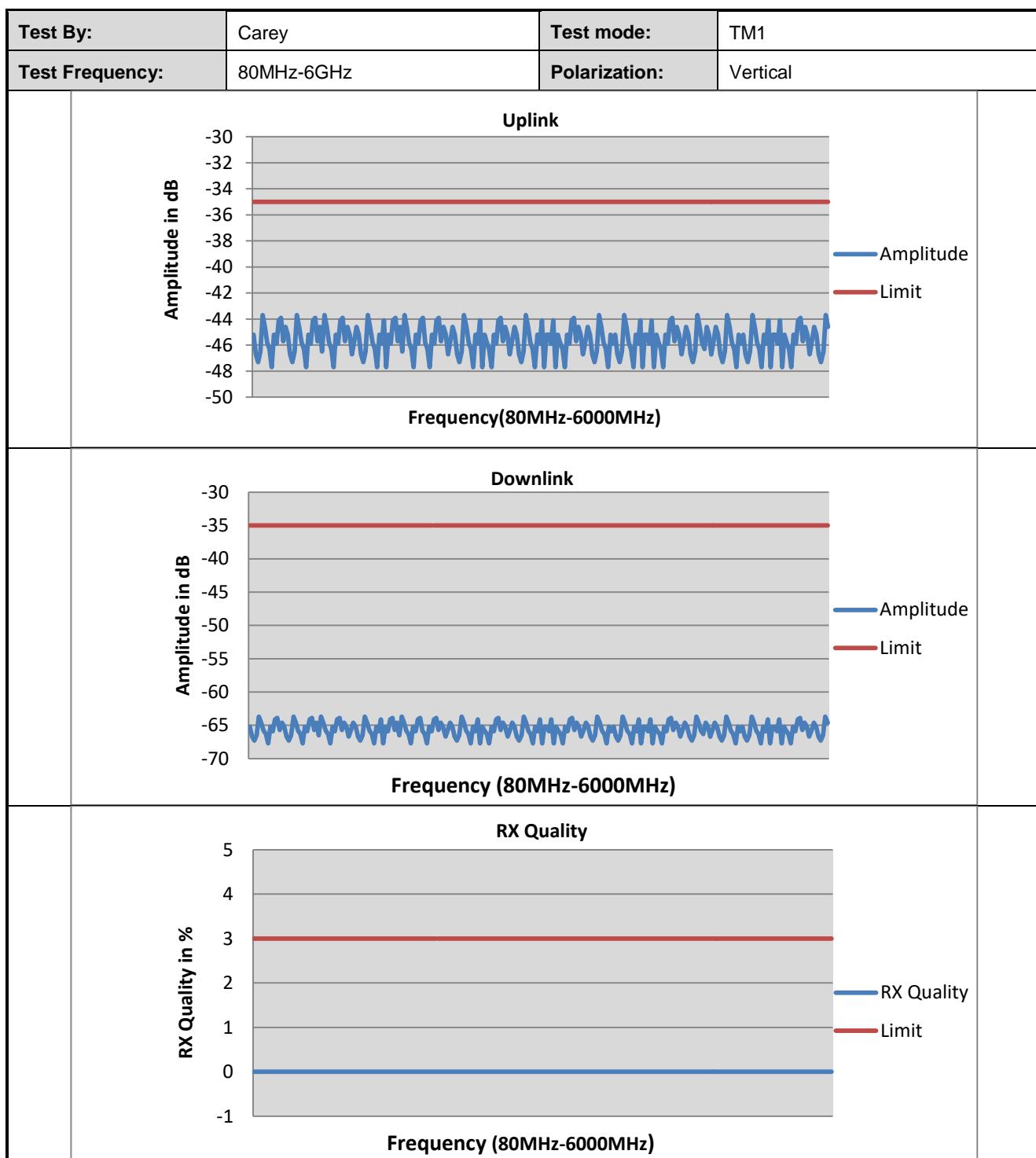
Test mode: TM 29

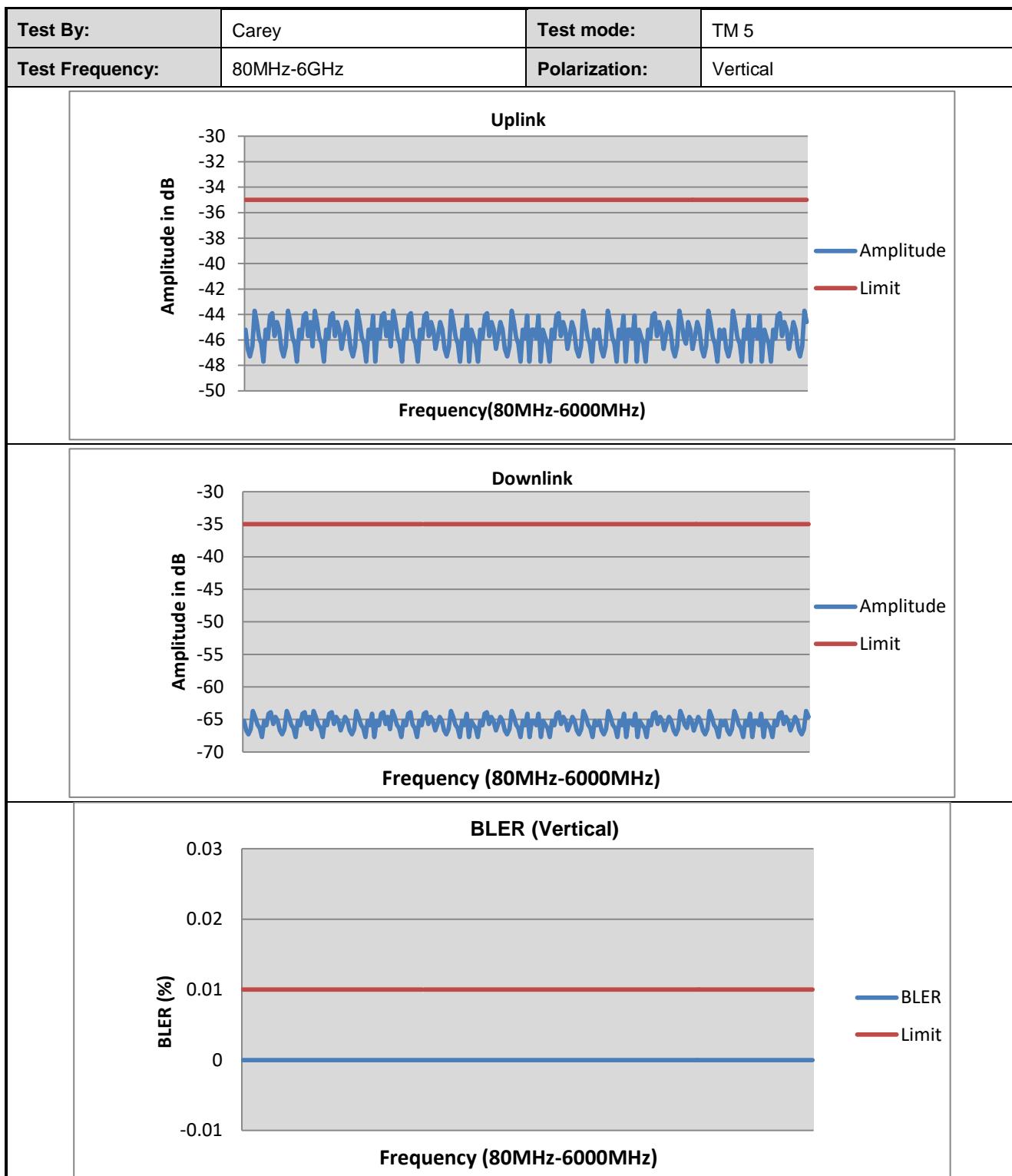
Frequency	Level	Modulation	Antenna Polarization	EUT Face	Observations (Performance Criterion)	Result		
80MHz-6GHz	3V/m	1kHz, 80% Amp. Mod, 1% increment, dwell time=3seconds	V	Front	CT/CR	Pass		
			H					
			V	Rear				
			H					
			V	Left				
			H					
			V	Right				
			H					
			V	Top				
			H					
			V	Bottom				
			H					
Remark:			4. Pre-test all EUT face, and just the worst case face (Rear) was shown in report.					
			5. Transmitter exclusion band: The exclusion band for transmitters and transmitter sections of transceivers is the band of frequencies over which no immunity tests with radiated RF are made. The exclusion band for transmitters extends three times the channel separation ($3 \times 200 \text{ kHz} = 600 \text{ kHz}$) centred on the nominal operating frequency of the transmitter.					
			6. Receiver and receivers of duplex transceivers exclusion band: The exclusion band for receivers and receiver sections of transceivers is the band of frequencies over which no immunity tests with radiated RF are made. The lower frequency of the exclusion band is the lower frequency of the receive band of the EUT minus 6 % of that frequency. The upper frequency of the exclusion band is the upper frequency of the receive band of the EUT plus 5 % of that frequency.					

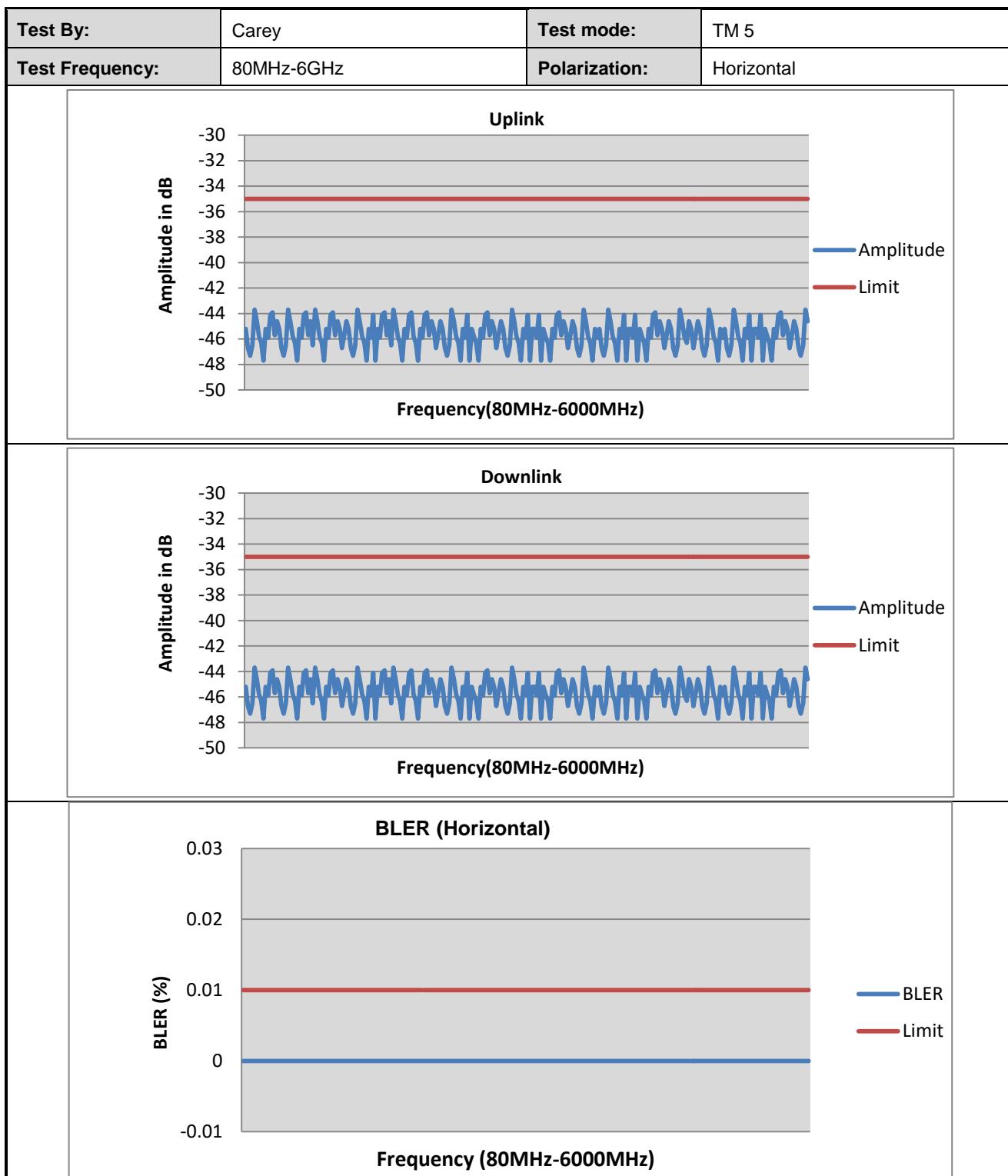
Special conditions of ETSI EN 301 489-19 V2.1.1 (2019-04)

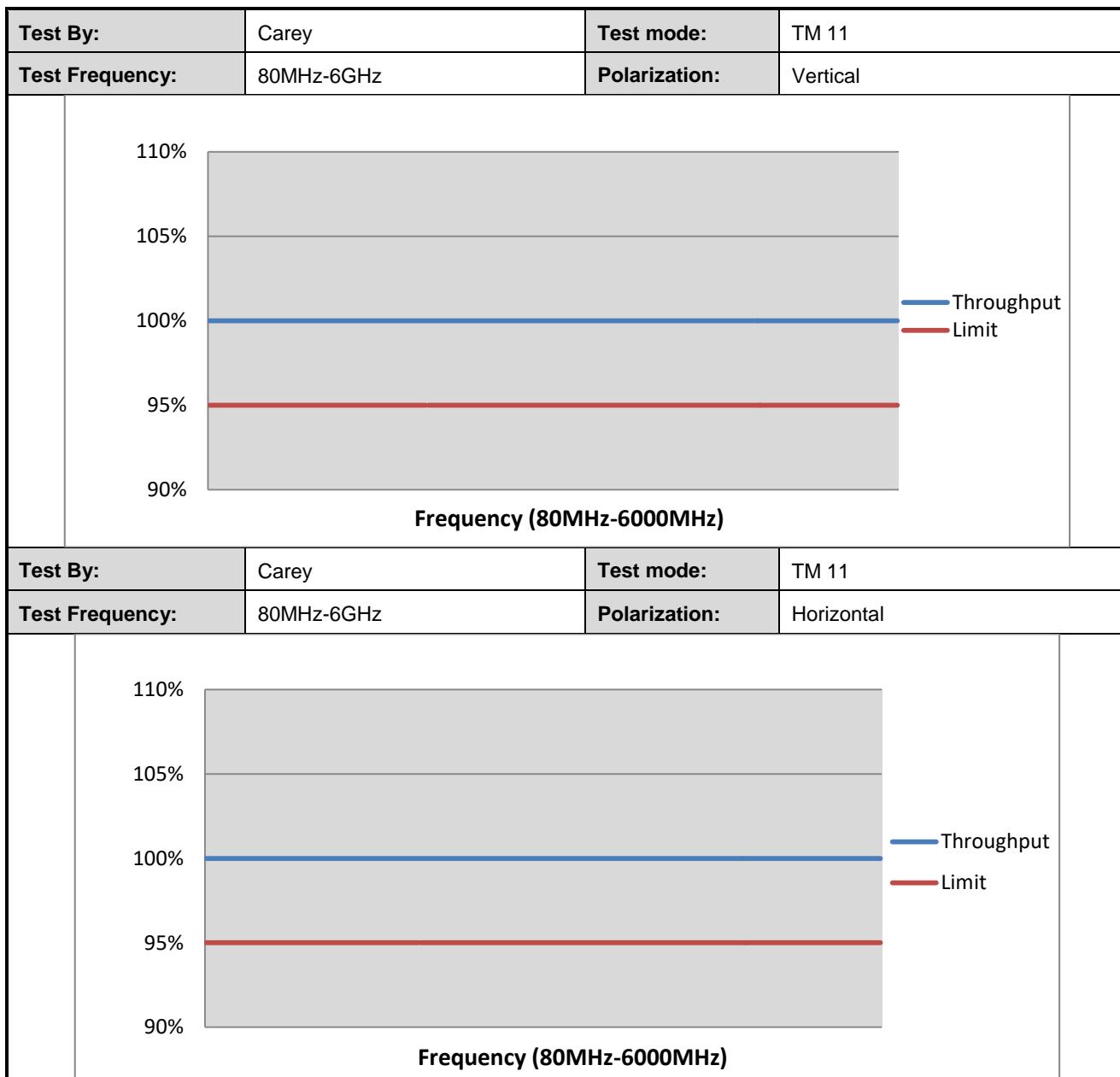
Frequency	Level	Modulation	Antenna Polarization	EUT Face	Observations (Performance Criterion)	Result		
80 MHz; 104 MHz; 136 MHz; 165 MHz; 200 MHz; 260 MHz; 330 MHz; 430 MHz; 560 MHz; 715 MHz ± 1 MHz; 920 MHz ± 1 MHz.	3V/m	(measured unmodulated) 100 % modulated by 200 Hz pulses of equal mark to space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





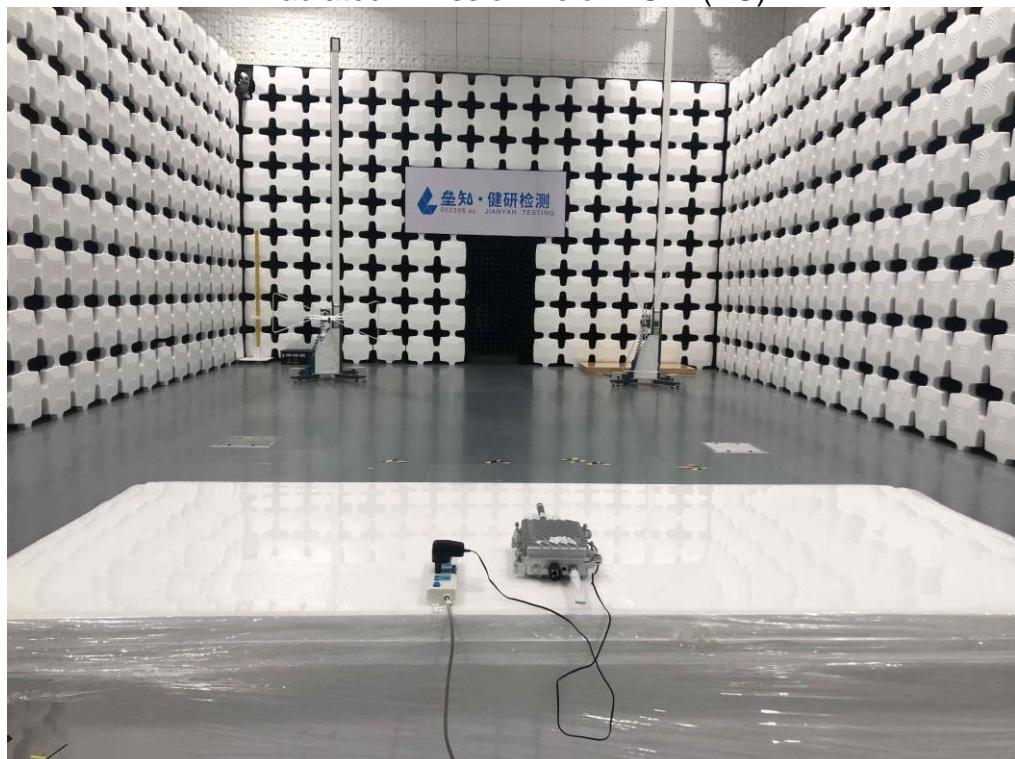






7 Test Setup Photo

Radiated Emission Below 1GHz(AC)



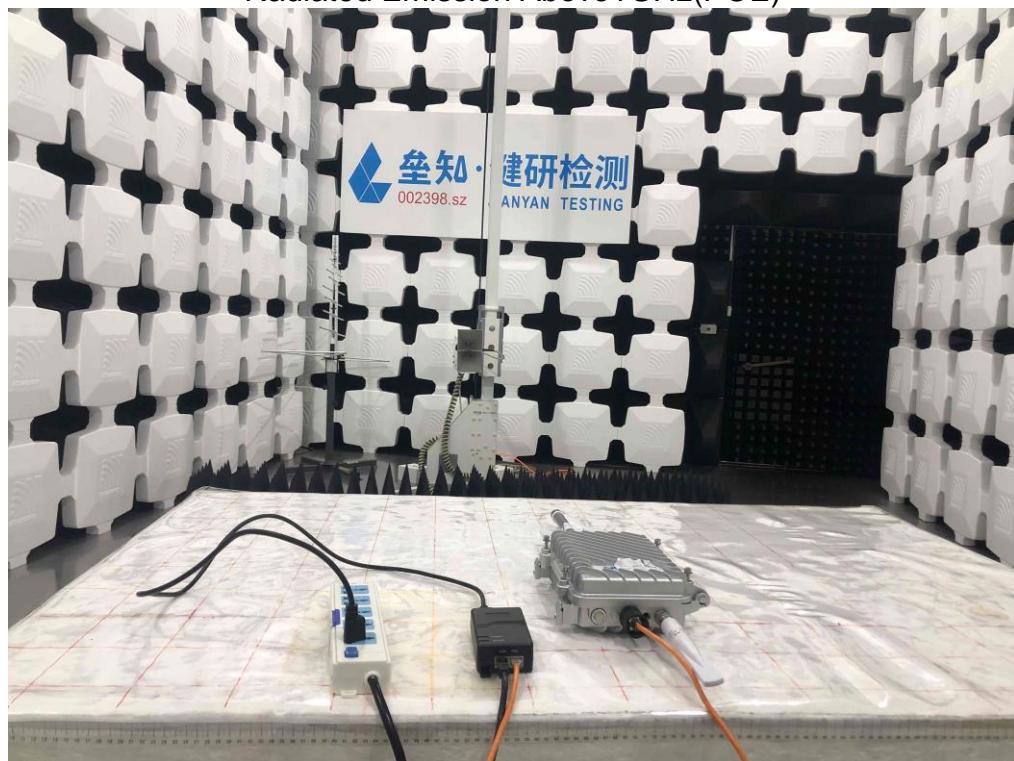
Radiated Emission Above 1GHz(AC)



Radiated Emission Below 1GHz(POE)



Radiated Emission Above 1GHz(POE)



Conducted Emission(AC)



Conducted Emission(POE)



Conducted Emission LAN (POE)



ESD(AC)



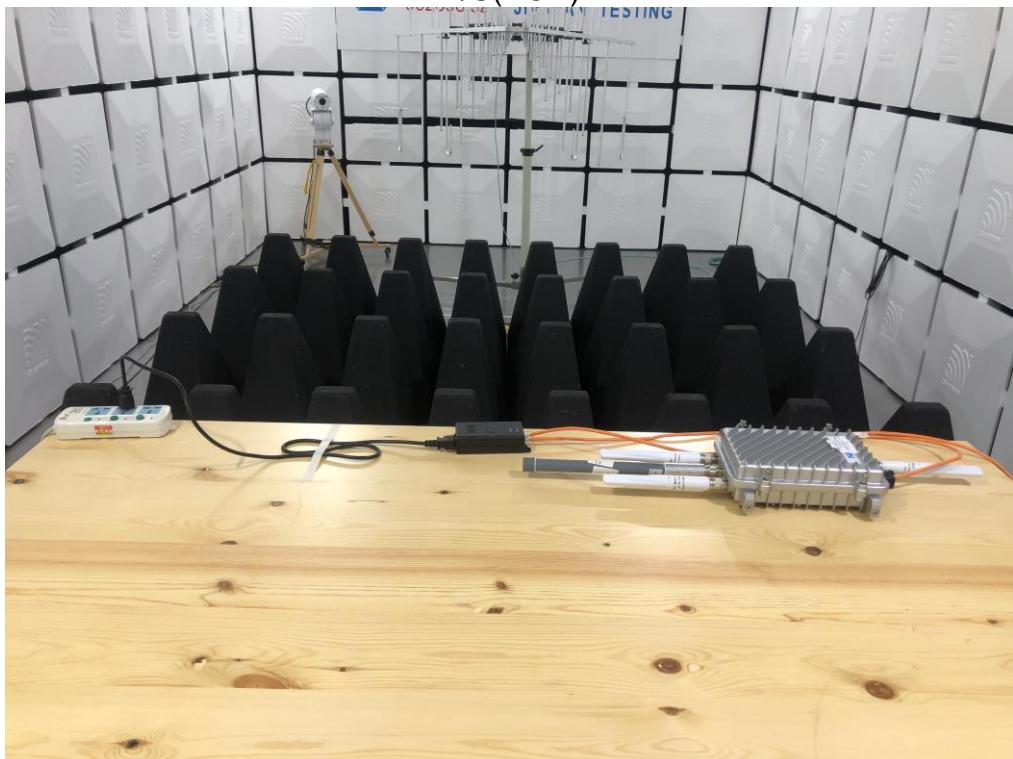
ESD(POE)



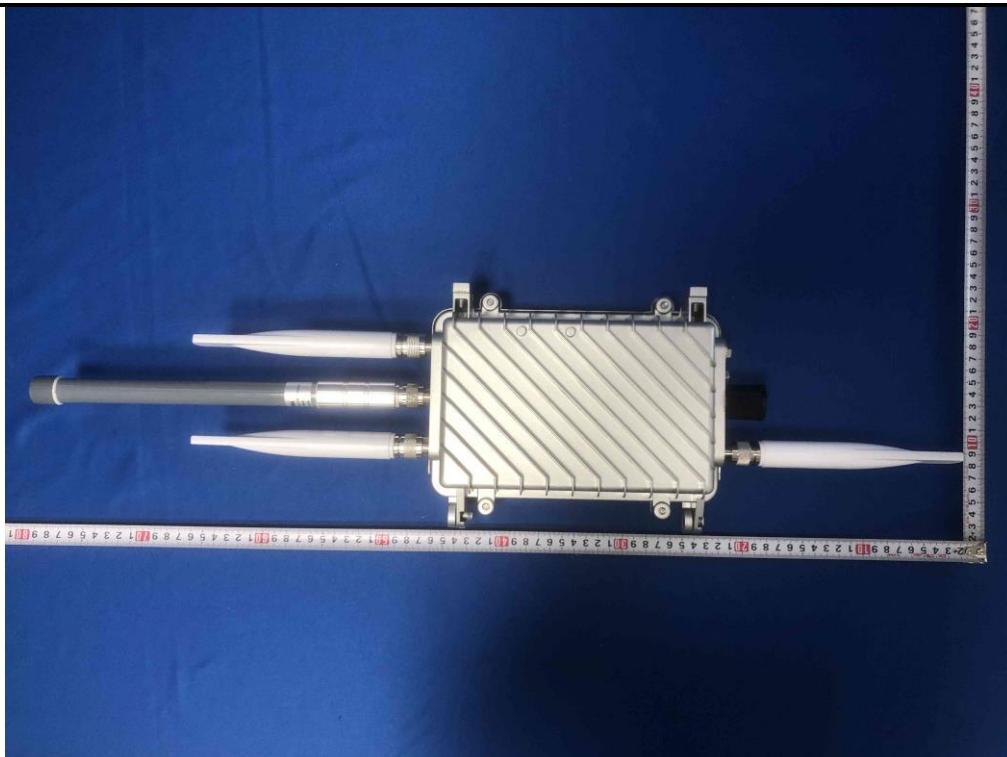
R/S(AC)

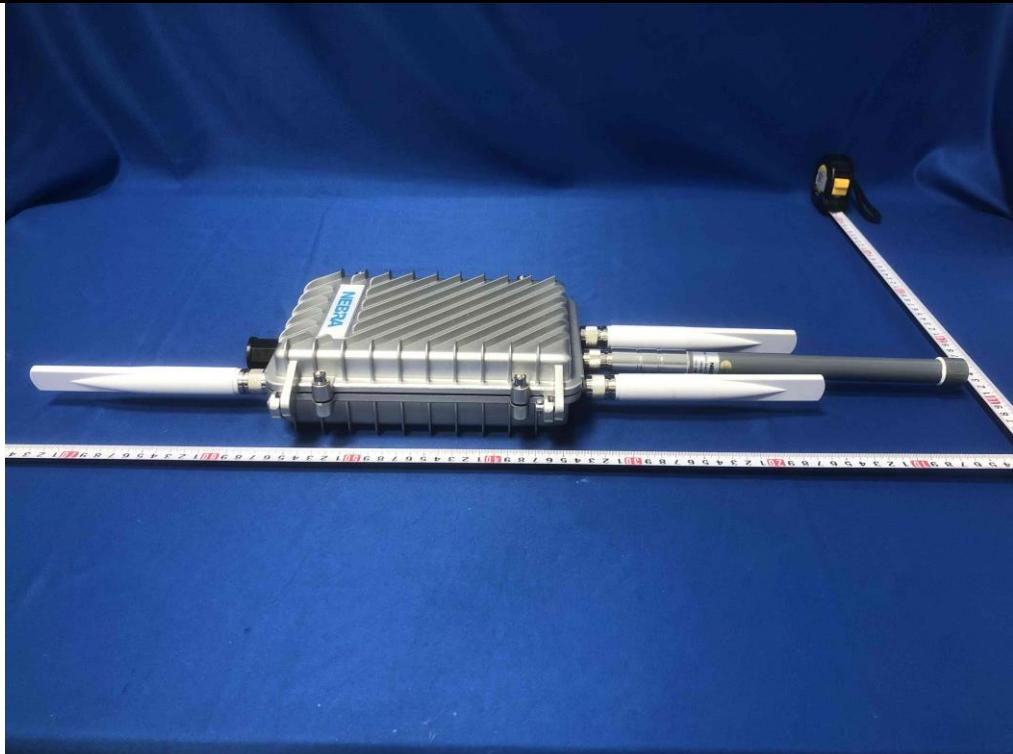


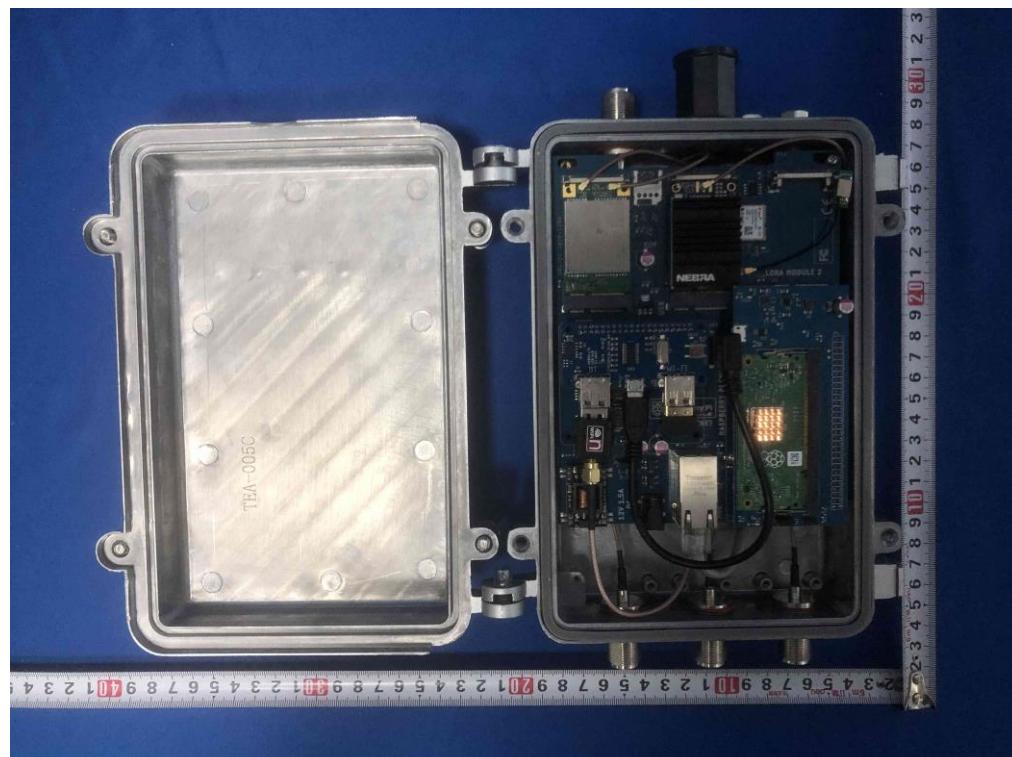
R/S(POE)

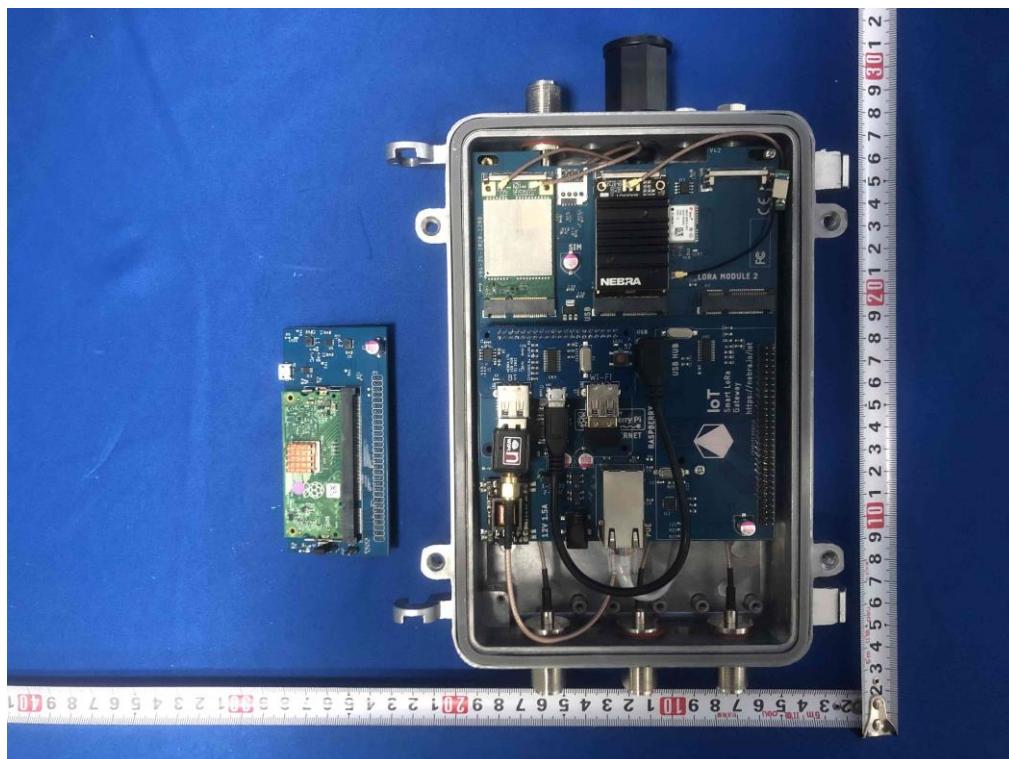
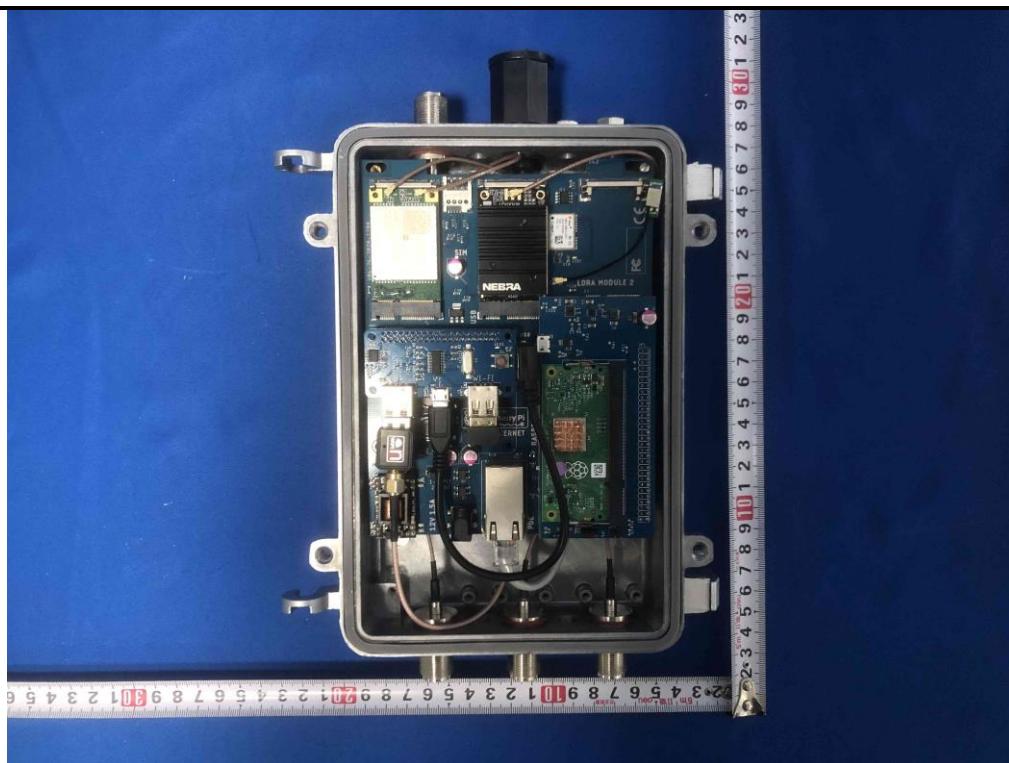


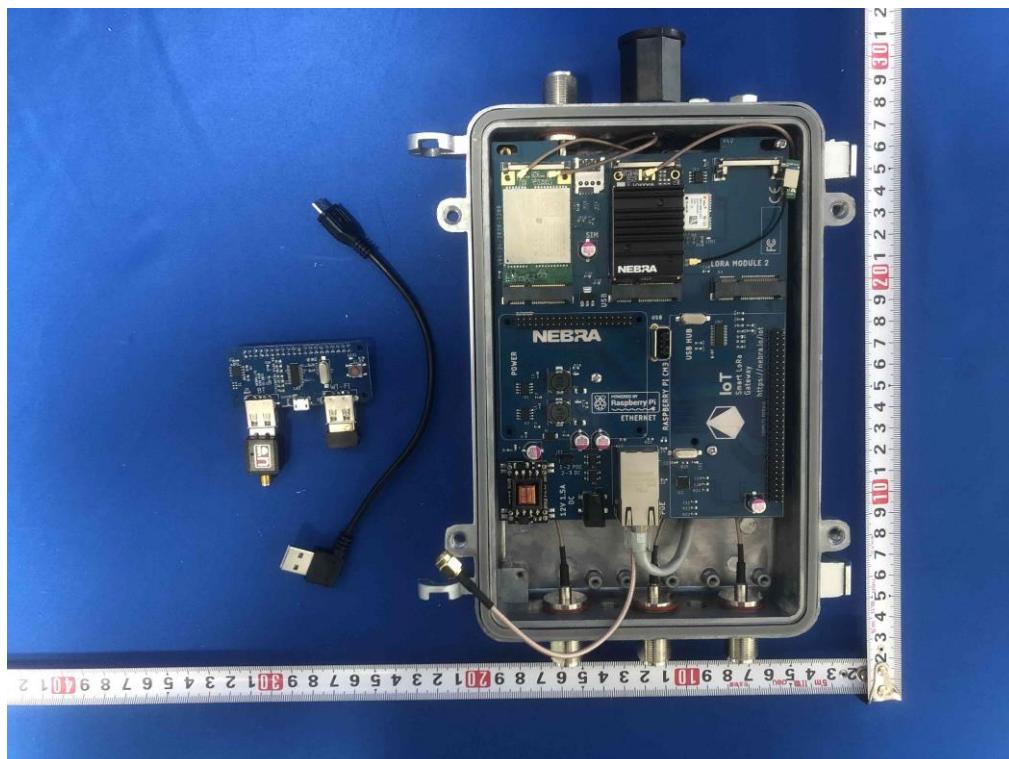
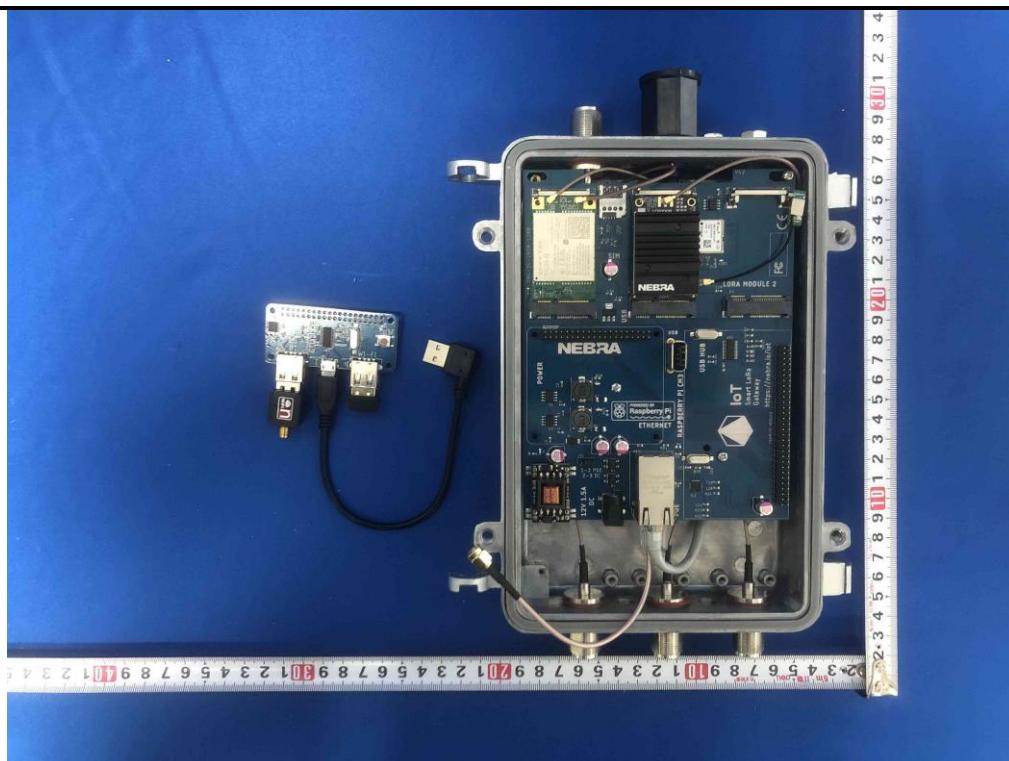
8 EUT Constructional Details

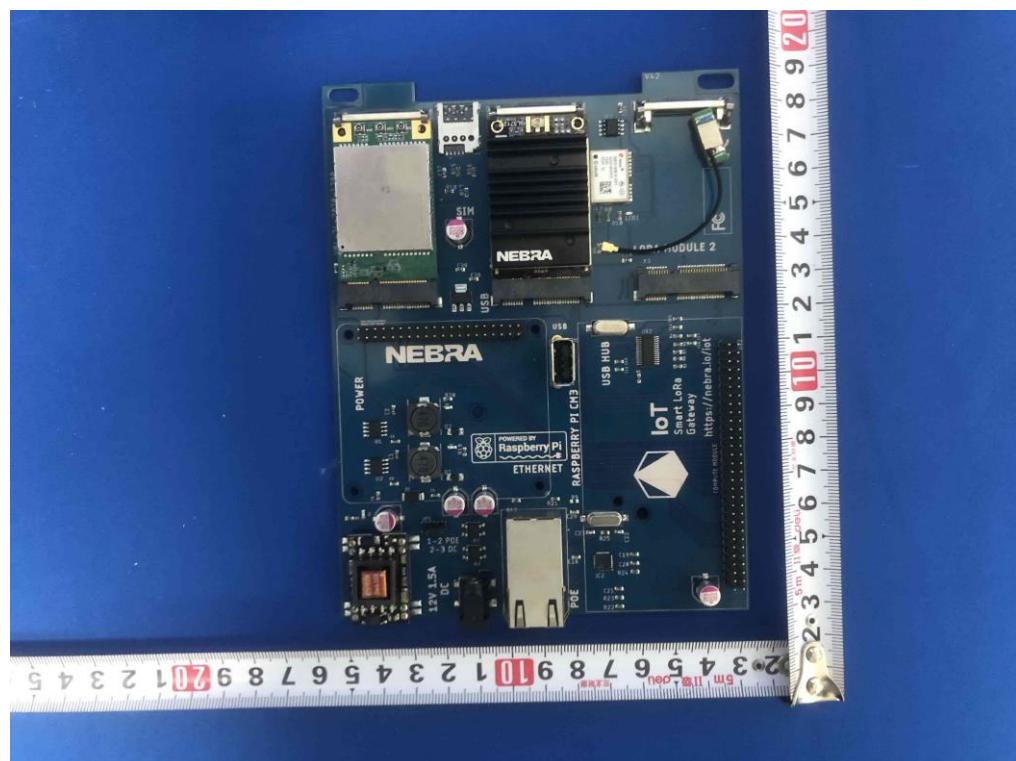
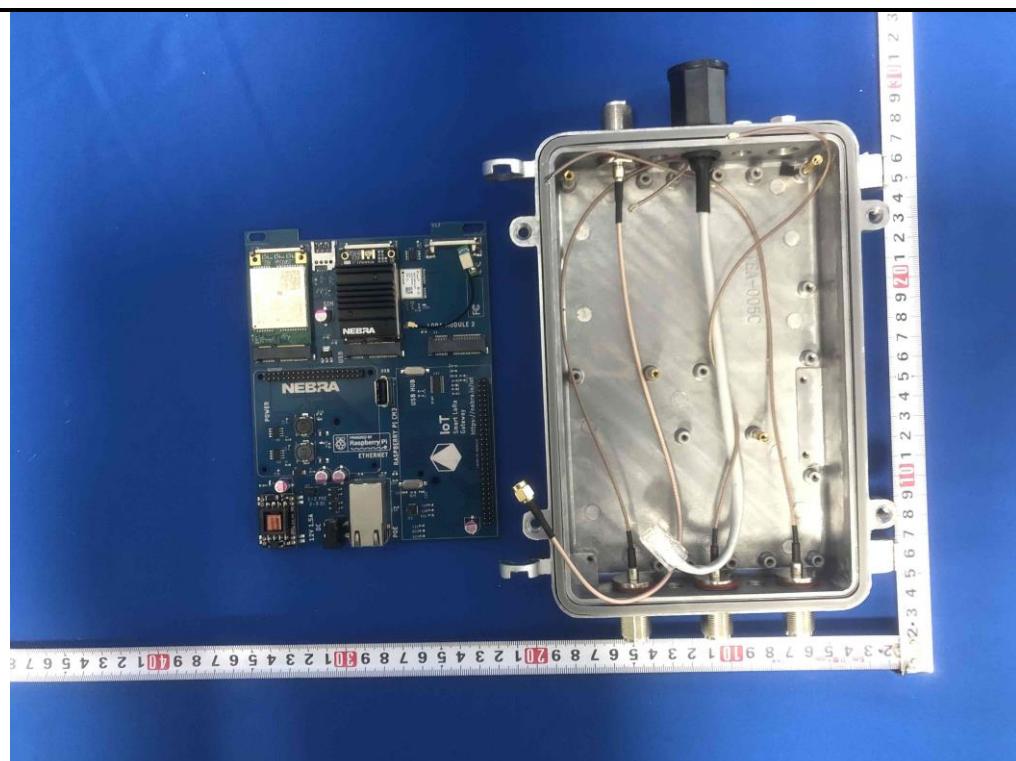


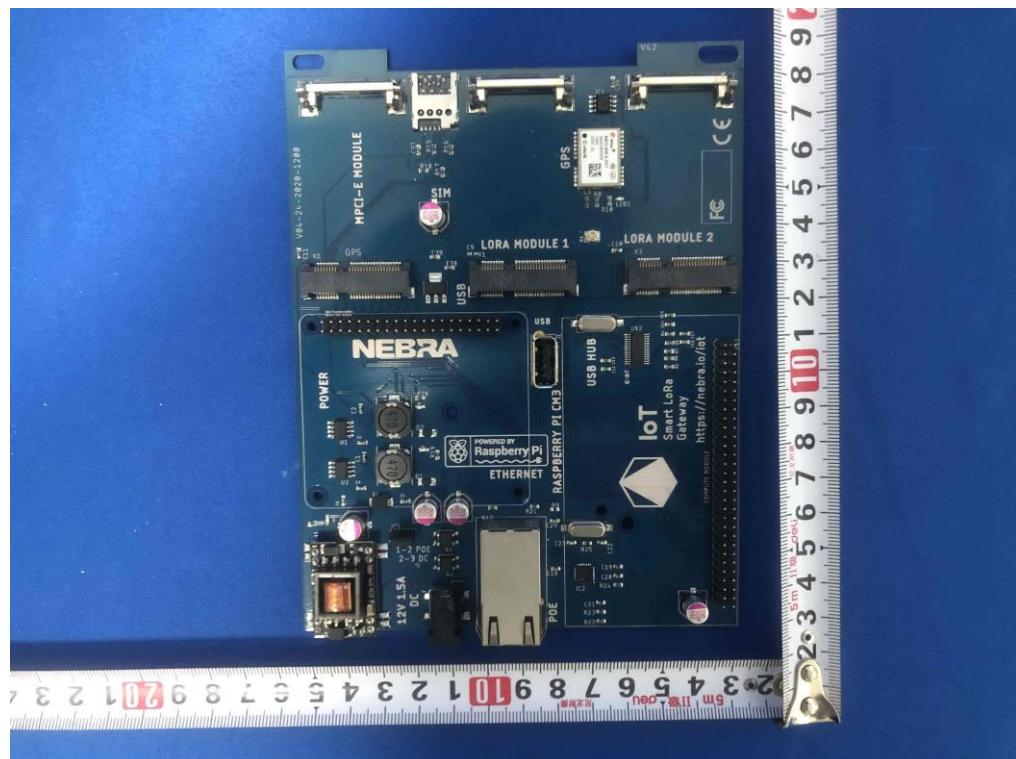
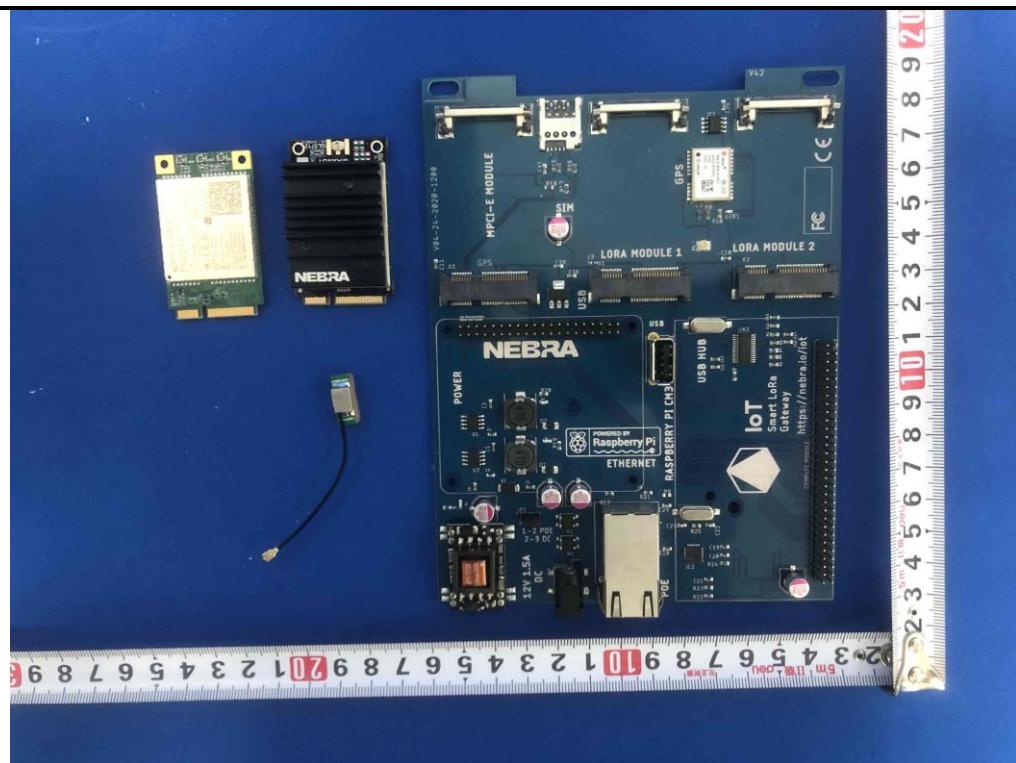


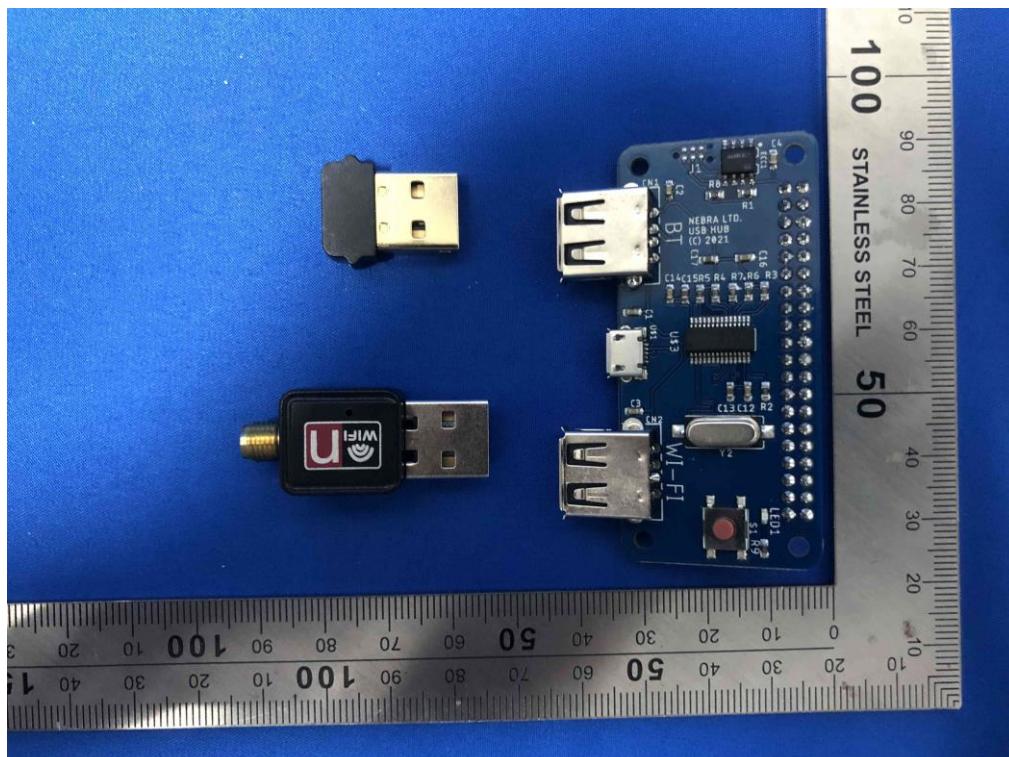
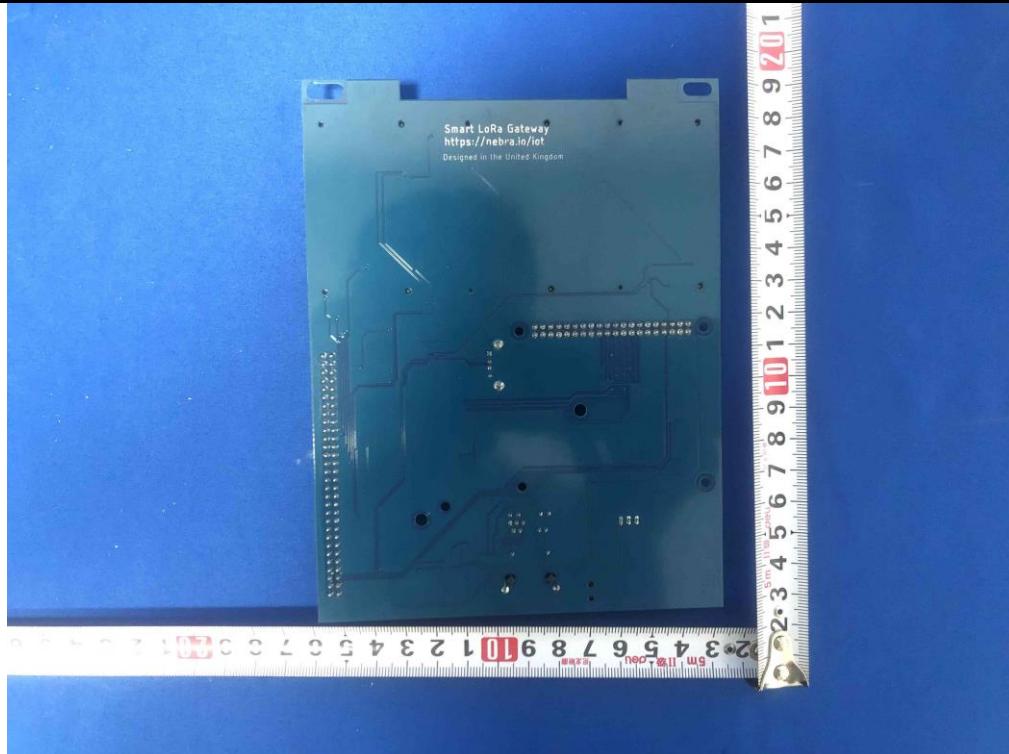


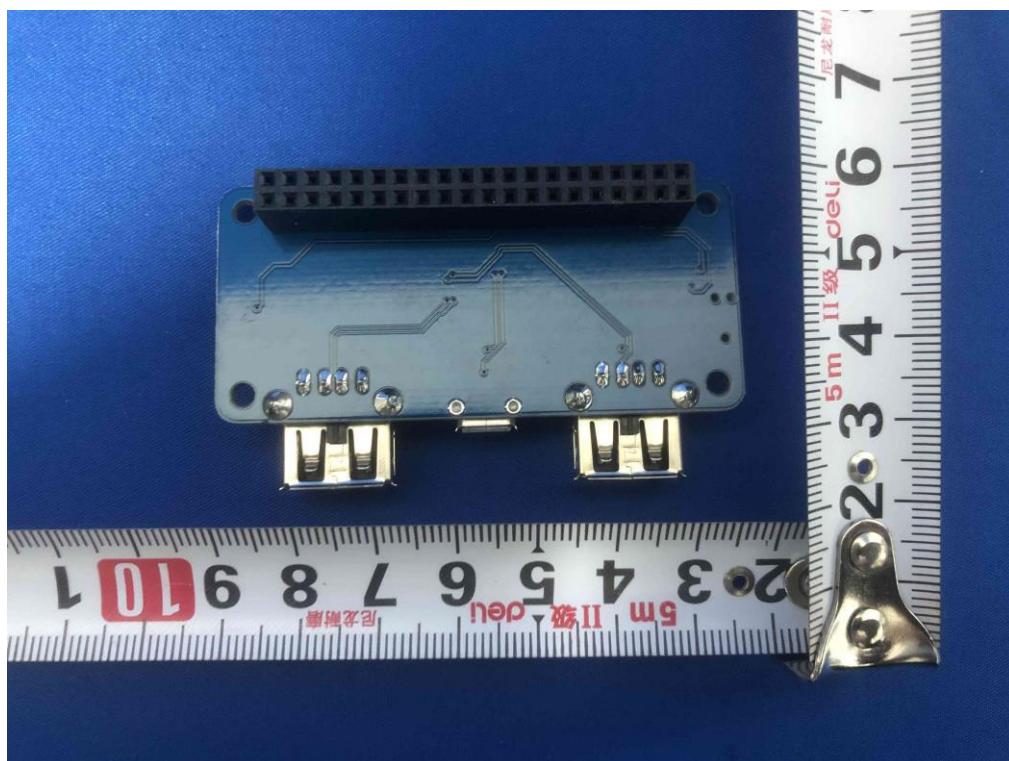
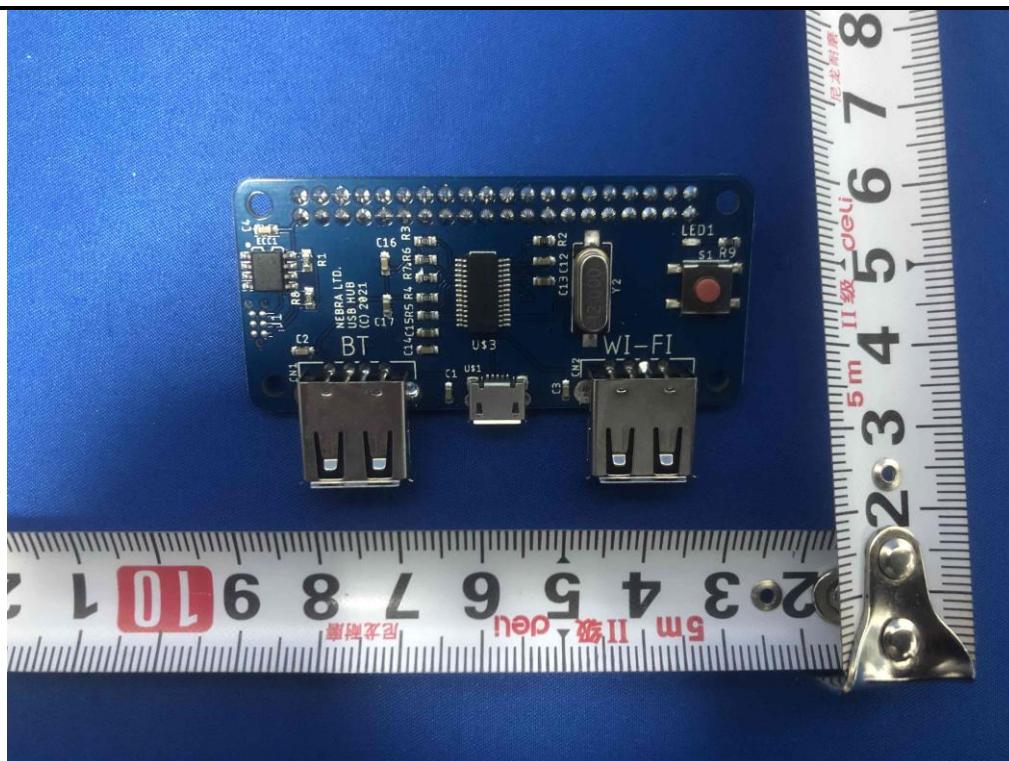


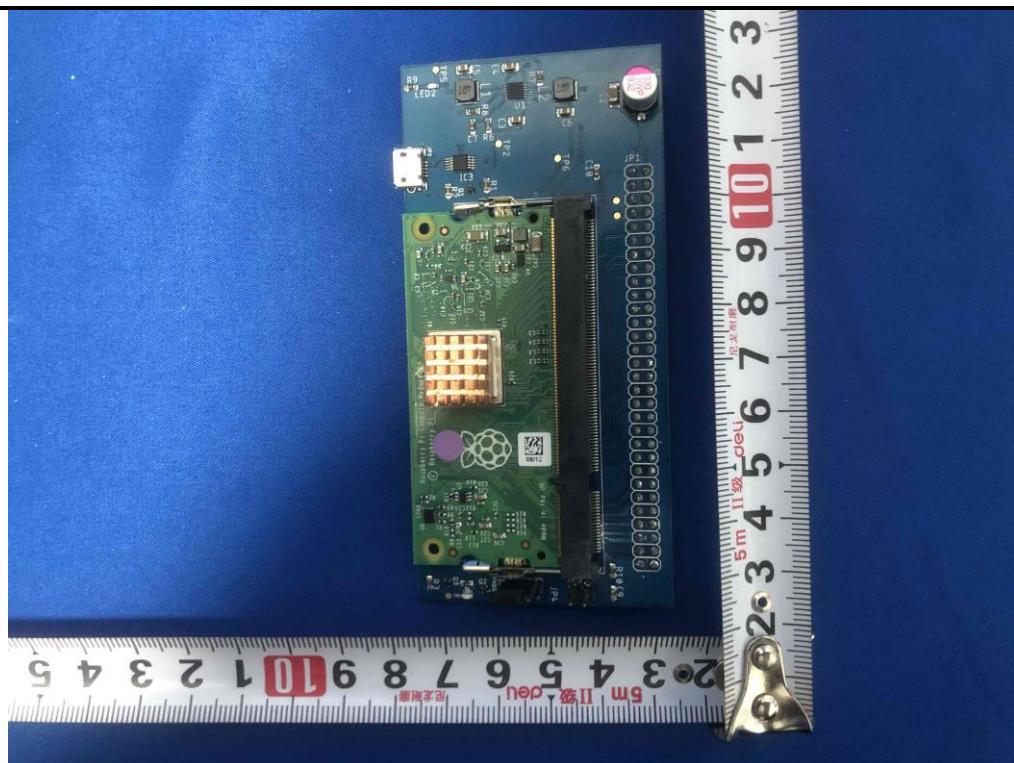


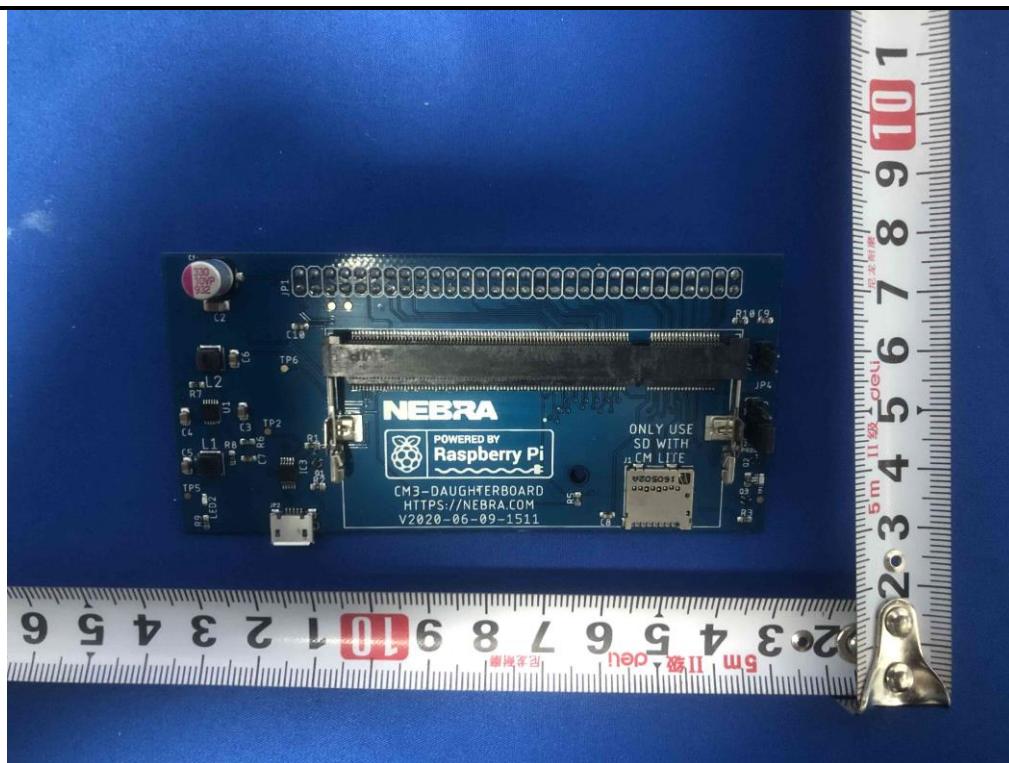


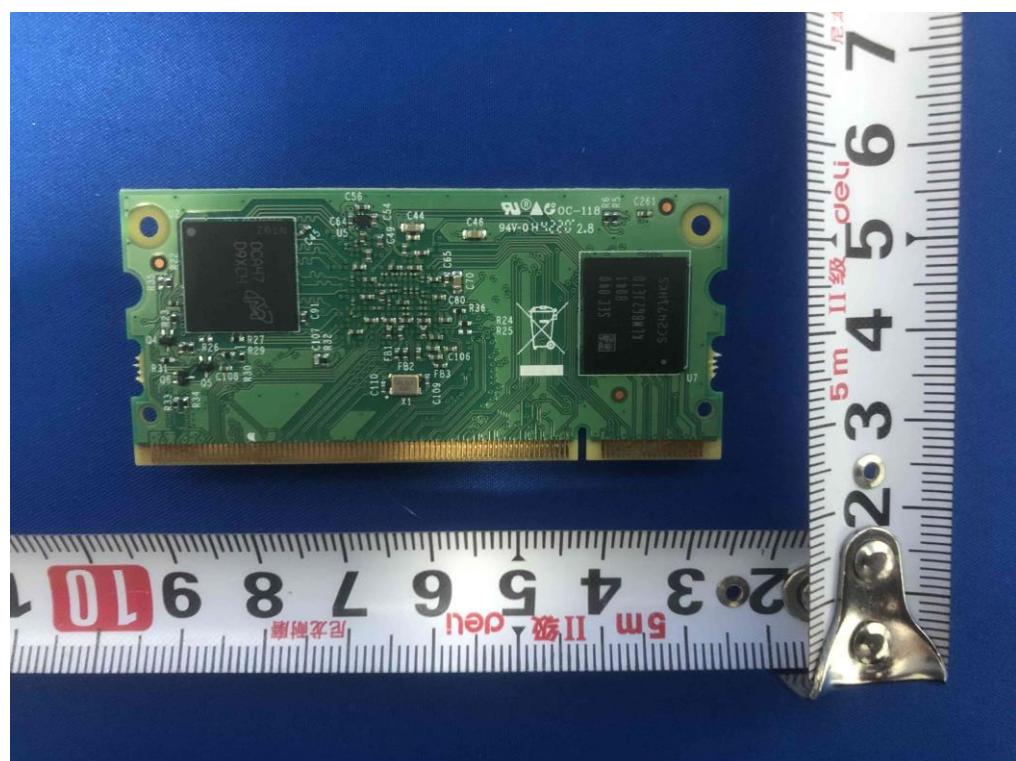
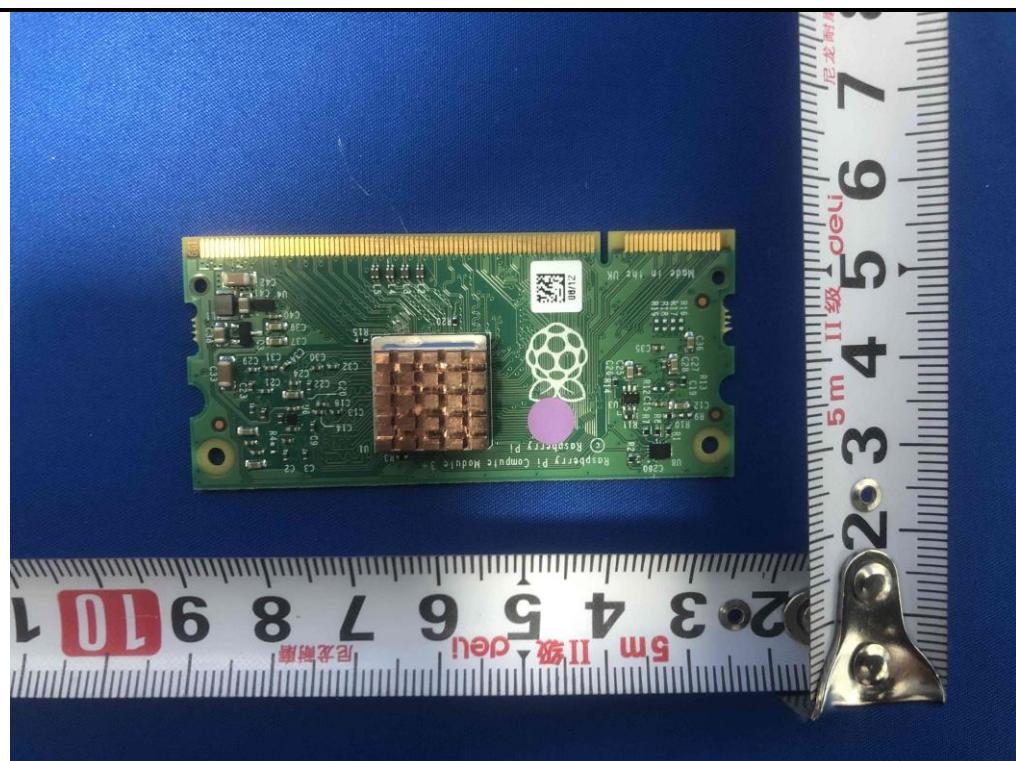


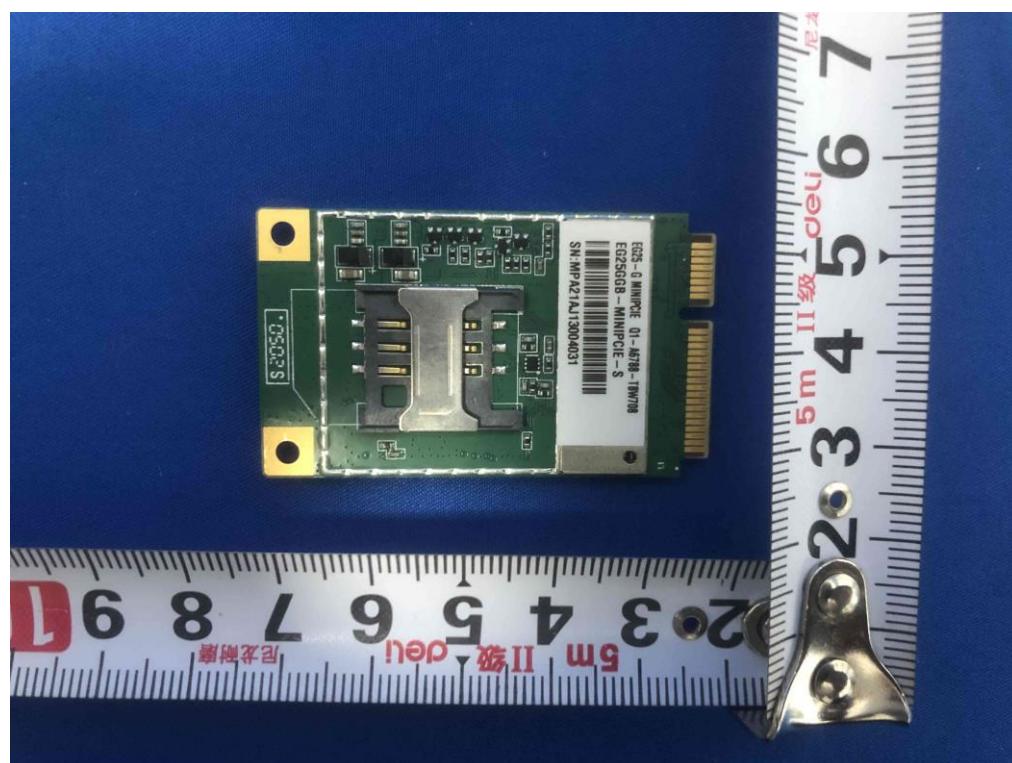




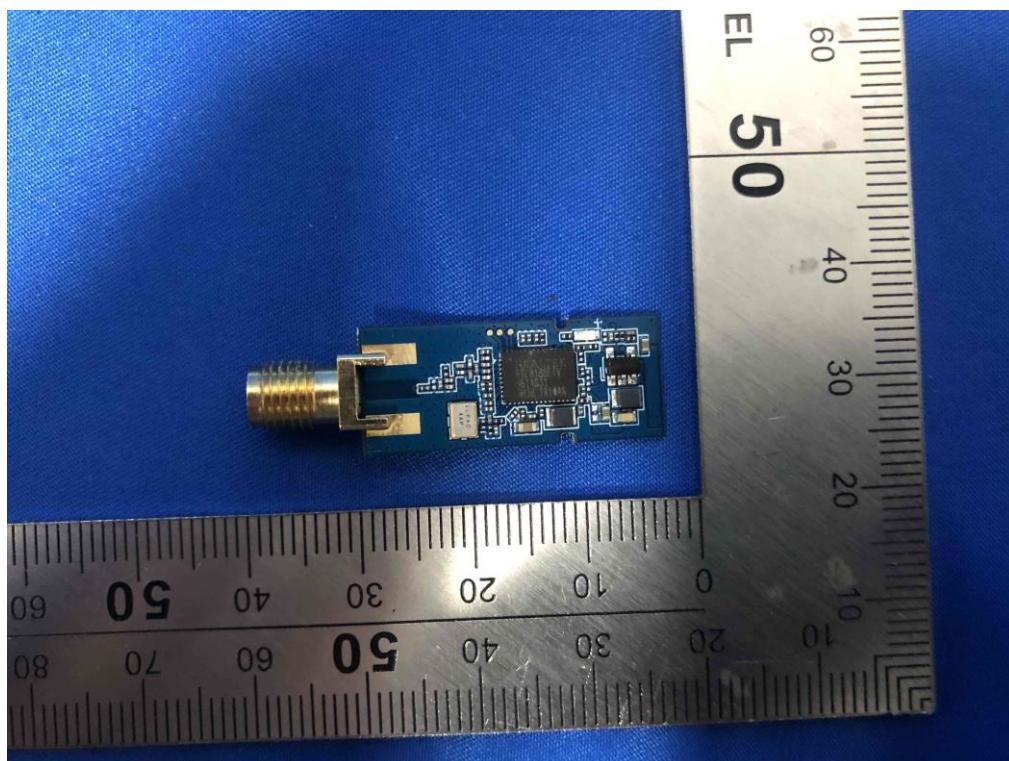
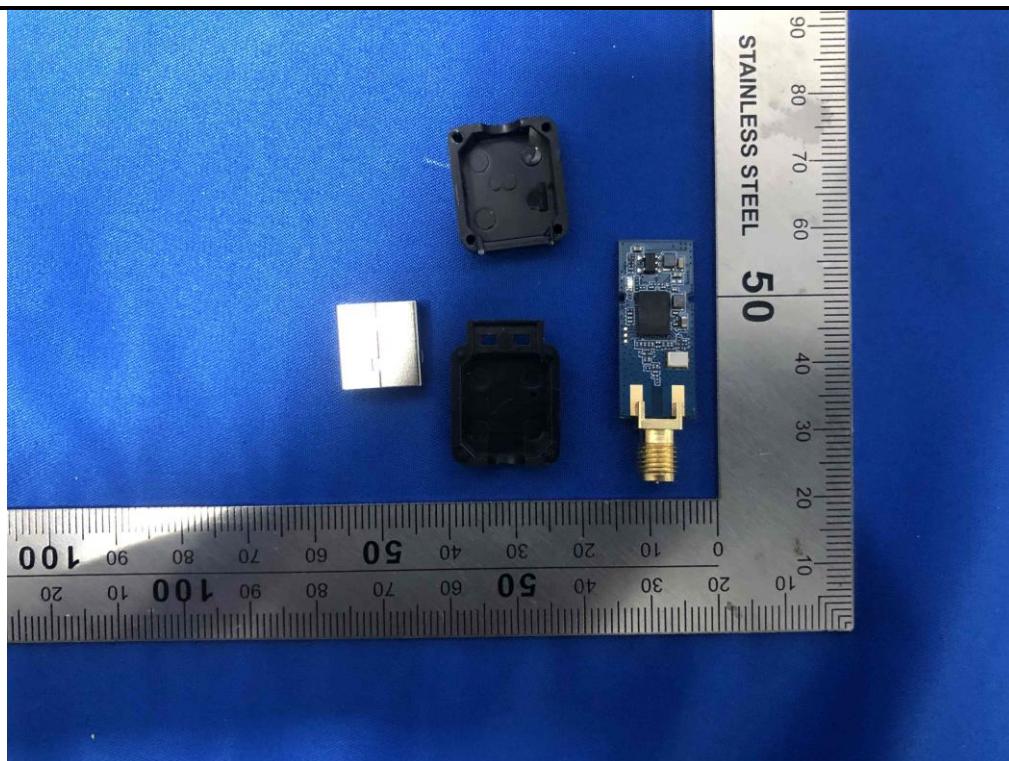


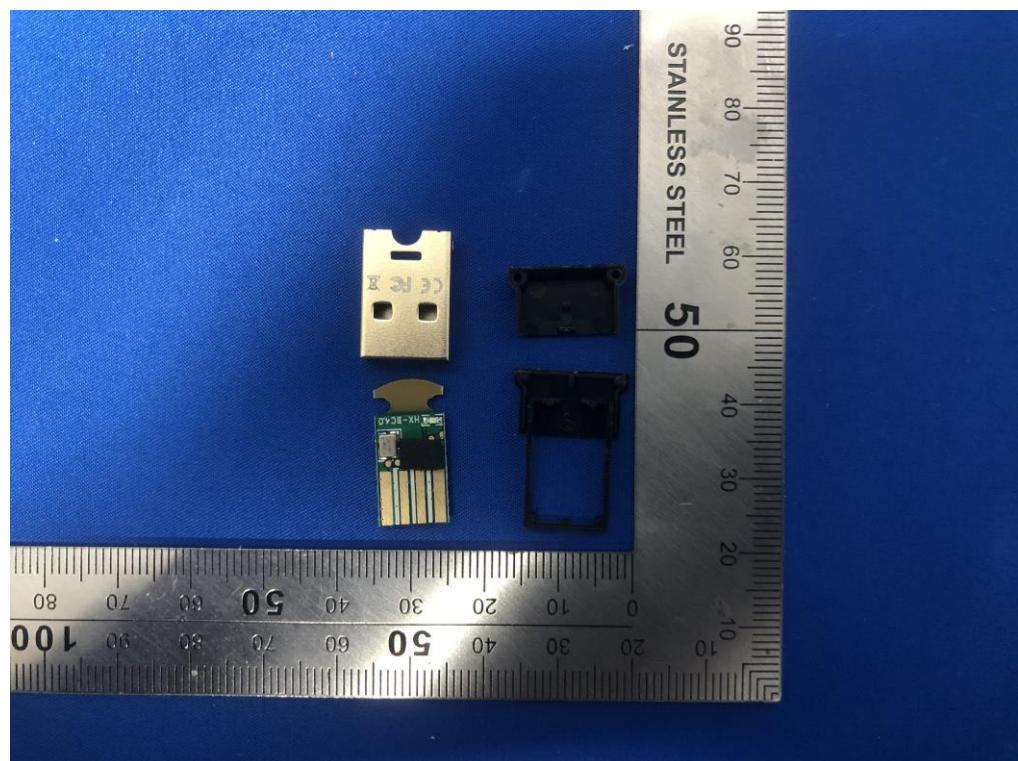
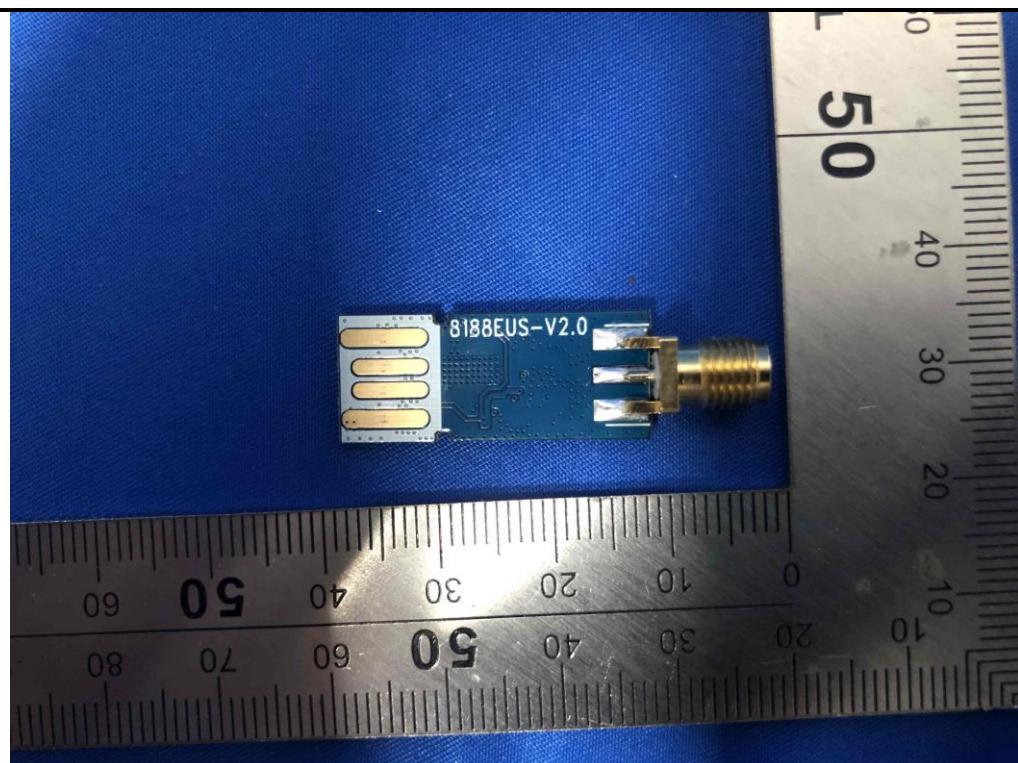


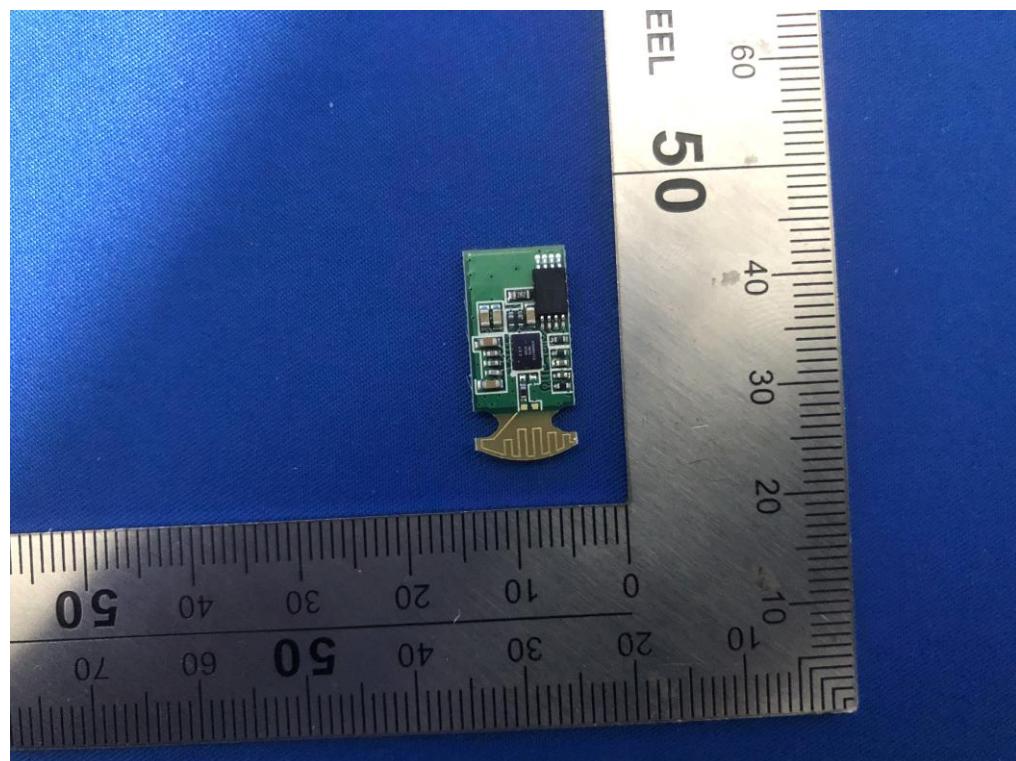
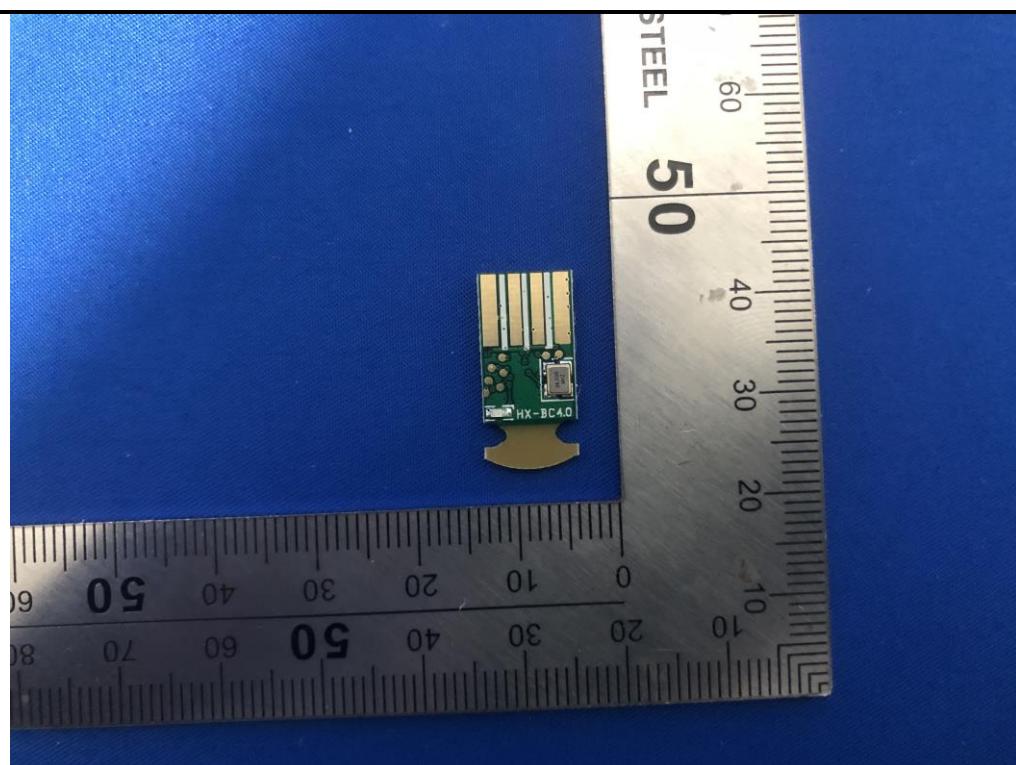


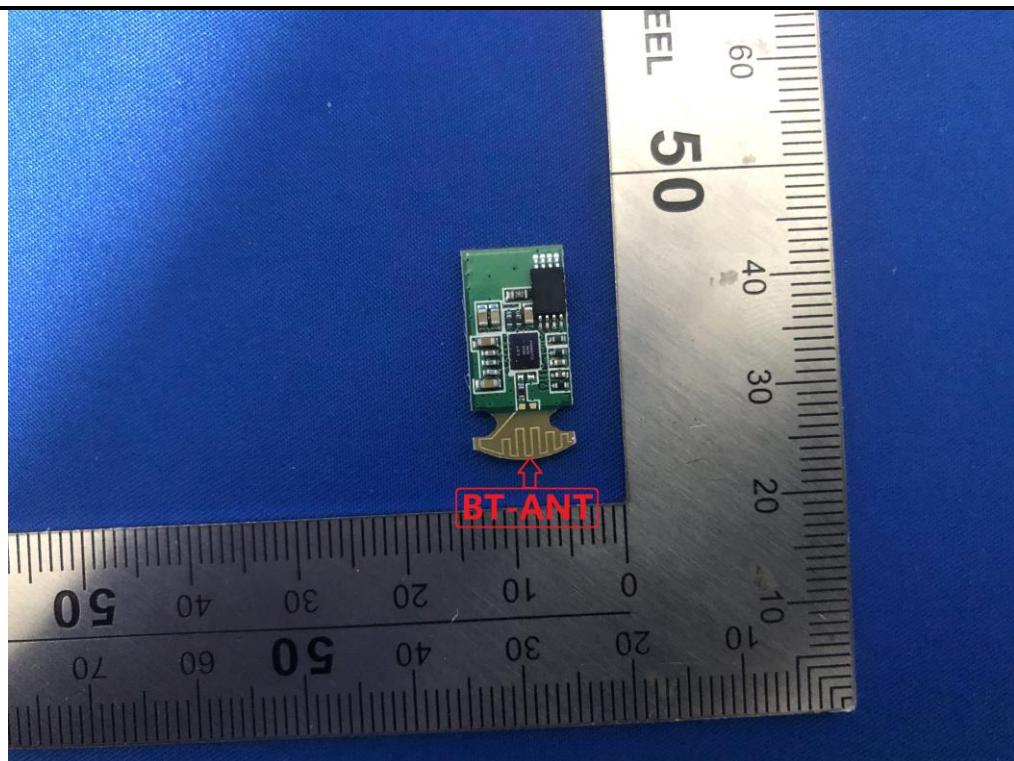


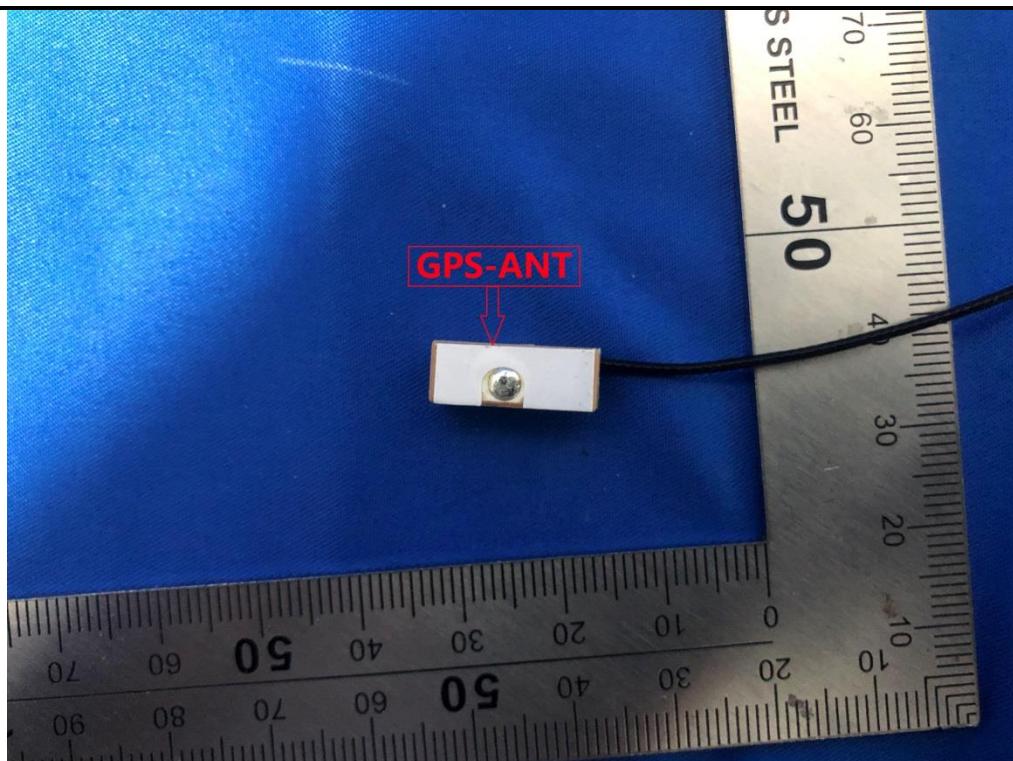


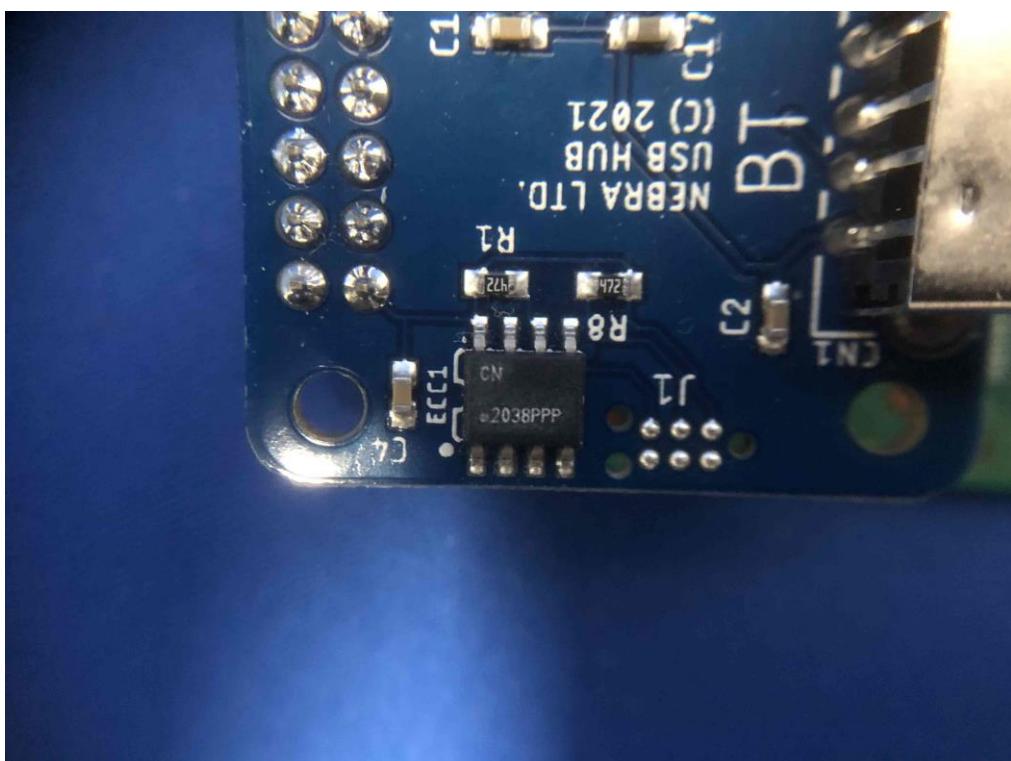
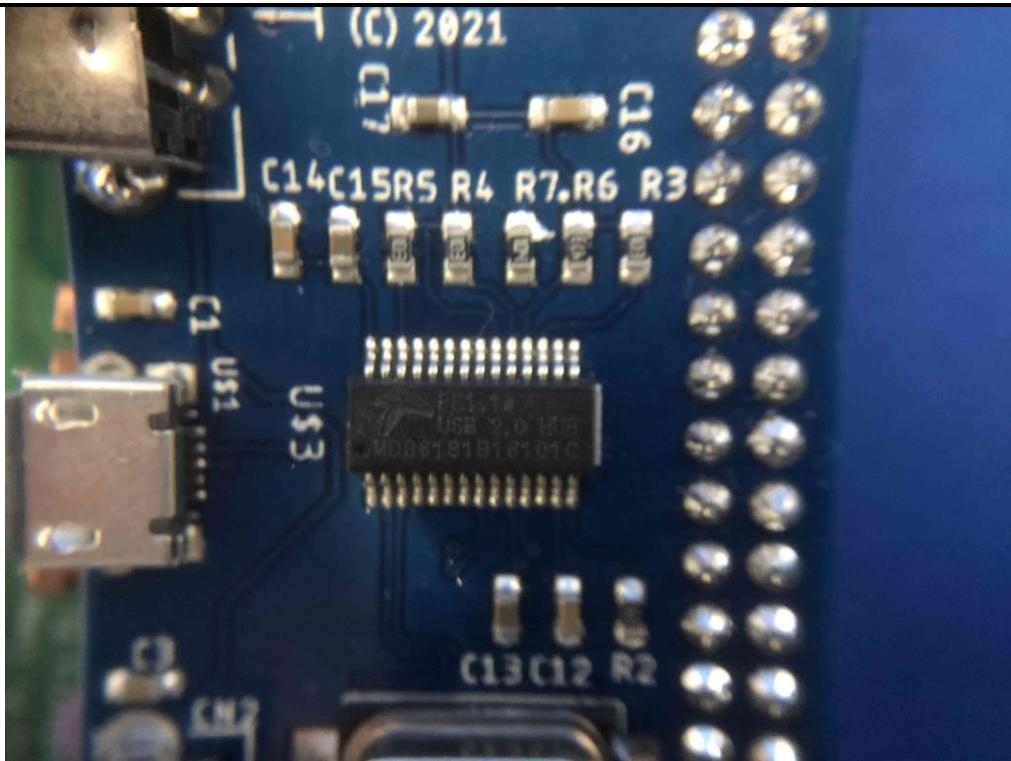




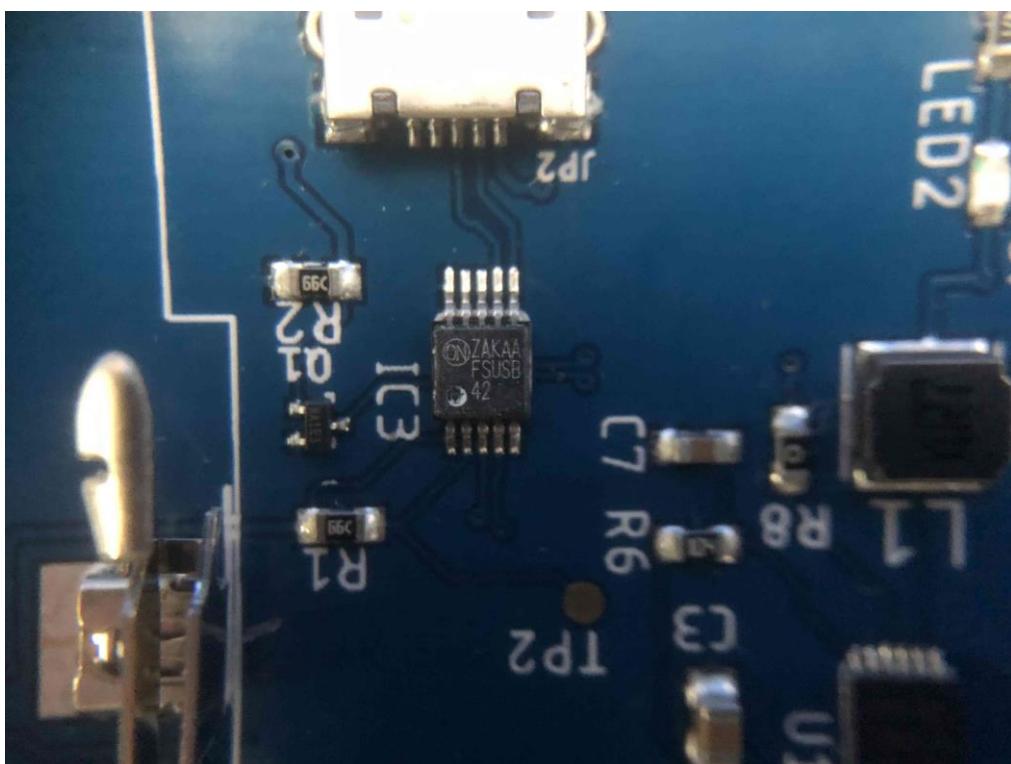
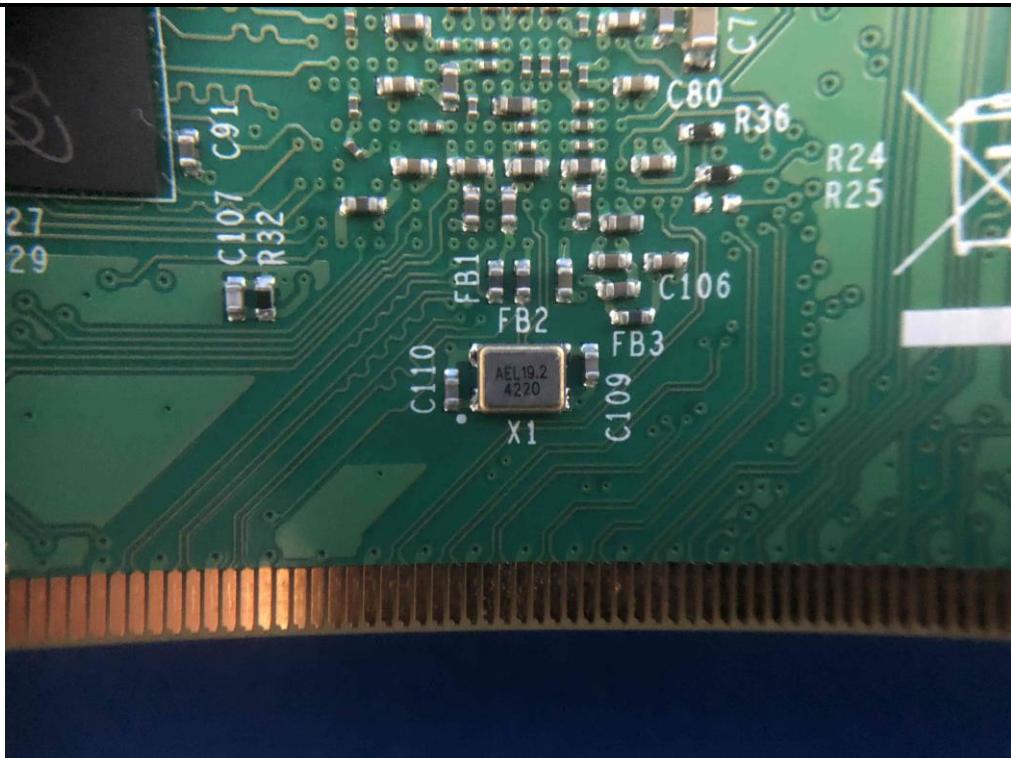


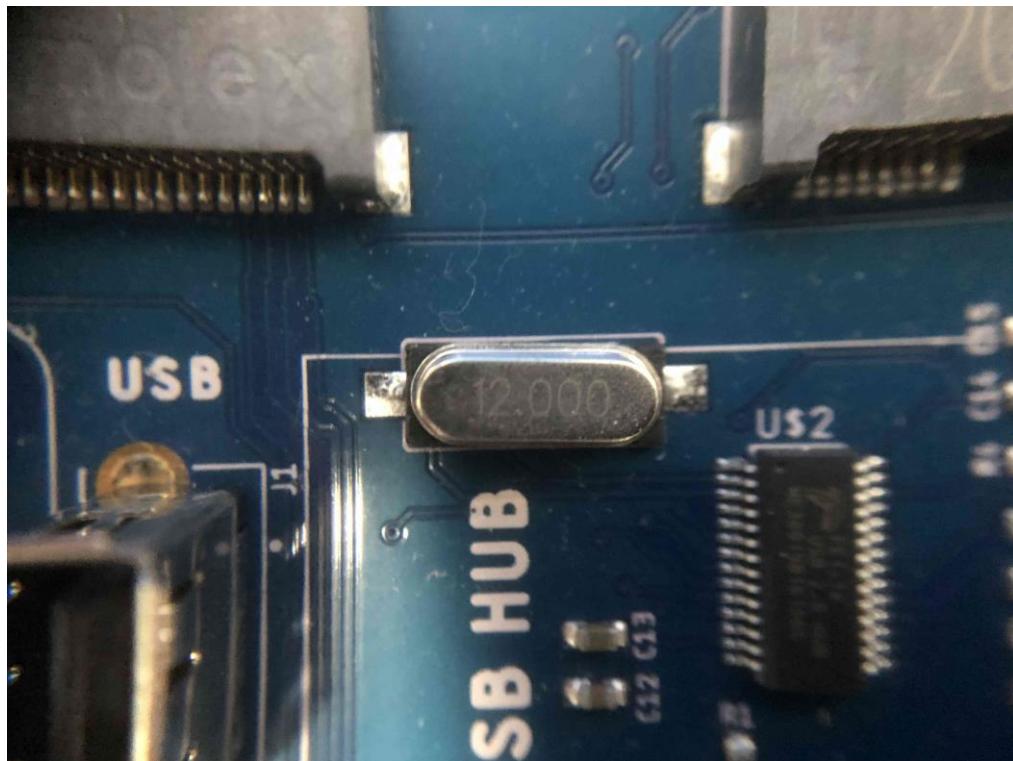


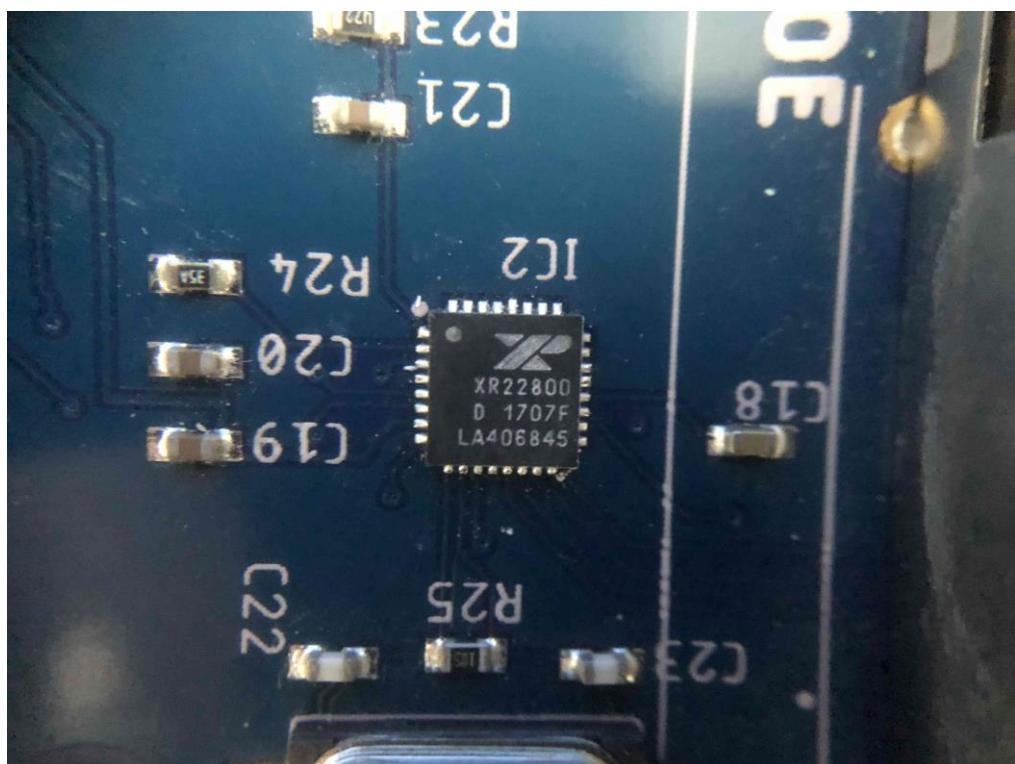
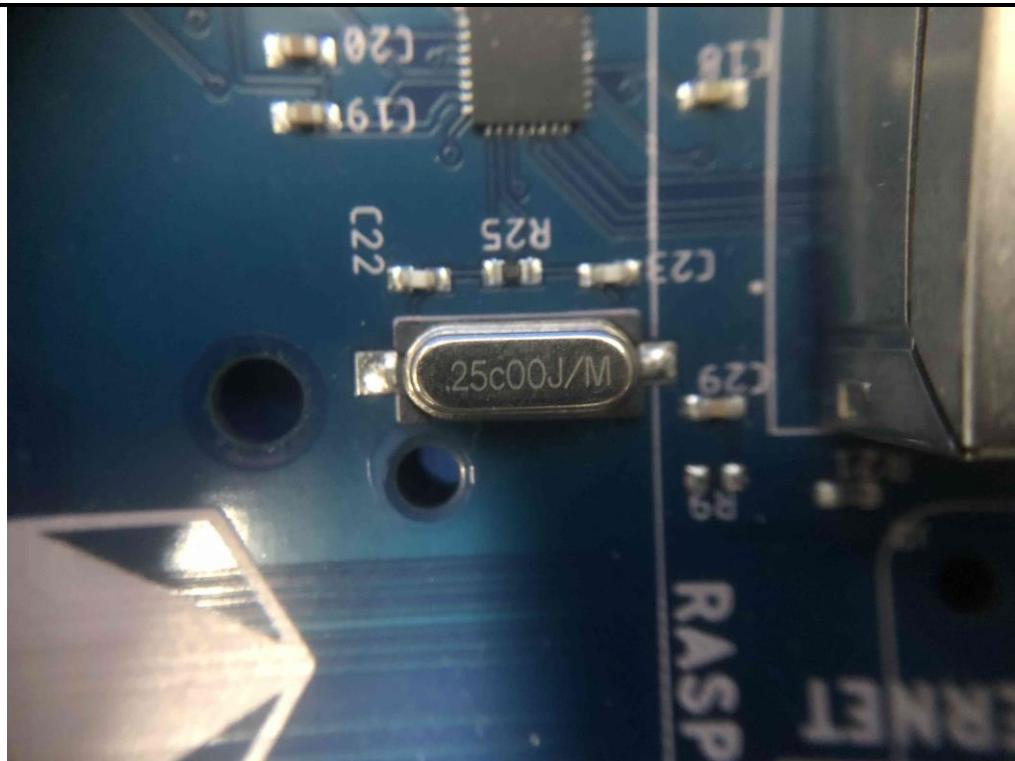


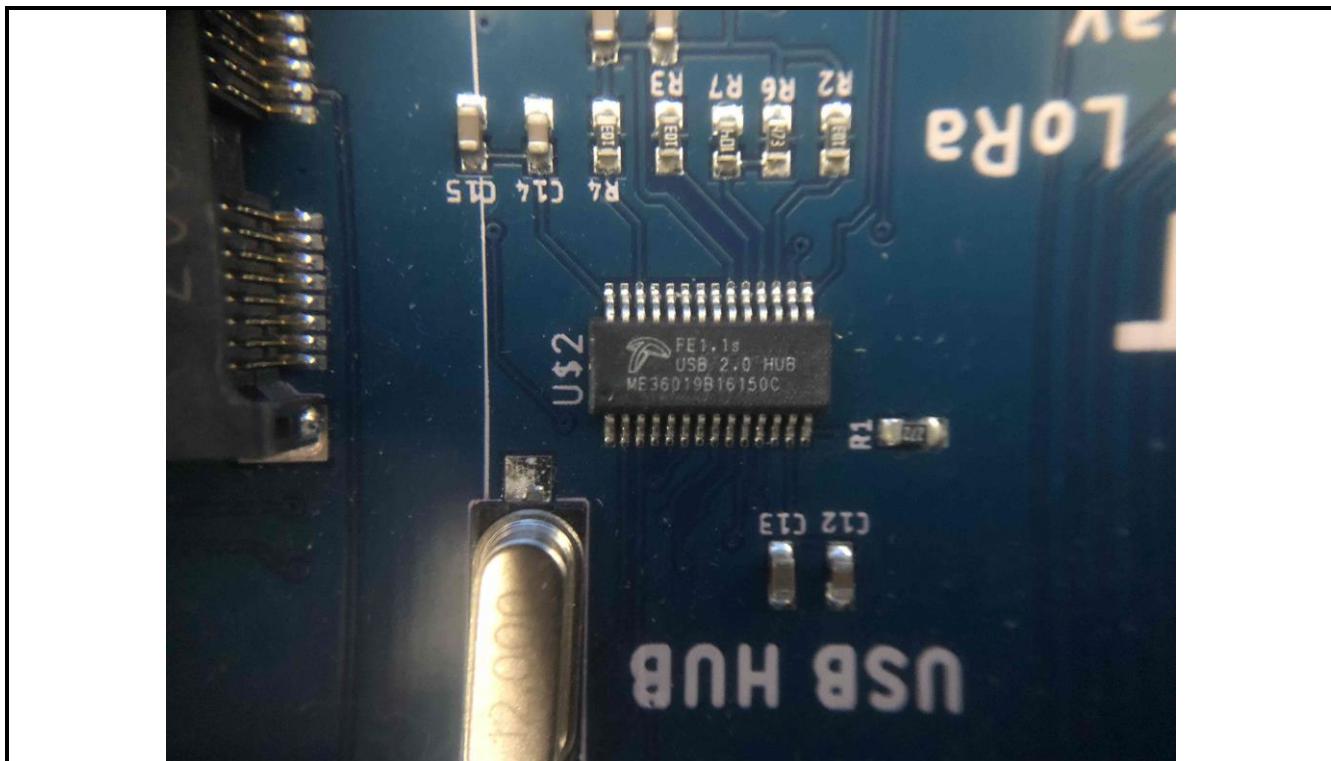












-----End of report-----