

RF Exposure evaluation

Product Name	: SX1262 868/915M LoRaWAN/GNSS HAT
Brand Name	: N/A
Model	: SX1262 868/915M LoRaWAN/GNSS HAT
	SX1262 868/915M LoRaWAN HAT, Core1262-HF, Core1262-LF
Series Model	: Pico-LoRa-SX1262-868M, Pico-LoRa-SX1262-915M, SX1262-LoRa-DTU-HF, SX1262-LoRa-DTU-HF-Kit, SX1262 868M LoRa HAT, SX1262 915M LoRa HAT
FCC ID	: 2BHC7-WAVESHARE2502
Applicant	: Shenzhen waveshare Electronics Co.,Ltd.
Address	: 202 2F, World Trade Plaza Funan Community Futian Street, Futian District, Shenzhen
Manufacturer	: Shenzhen waveshare Electronics Co.,Ltd.
Address	: 202 2F, World Trade Plaza Funan Community Futian Street, Futian District, Shenzhen
Standard(s)	: 47CFR §1.1310, 47CFR §2.1091 KDB447498 D01 General RF Exposure Guidance v06
Date of Receipt	: Jan. 09, 2025
Date of Test	: Jan. 10, 2025~ Jan. 16, 2025
Issued Date	: Jan. 17, 2025

Issued By: Guangdong Asia Hongke Test Technology Limited

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Reviewed by: Leon.yi

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Note: This device has been tested and found to comply with the standard(s) listed, this test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory. This report shall not be reproduced except in full, without the written approval of Guangdong Asia Hongke Test Technology Limited. If there is a need to alter or revise this document, the right belongs to Guangdong Asia Hongke Test Technology Limited, and it should give a prior written notice of the revision document. This test report must not be used by the client to claim product endorsement.

Guangdong Asia Hongke Test Technology Limited

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Report Revise Record

Report Version	Issued Date	Notes
M1	Jan. 17, 2025	Initial Release

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1 GENERAL INFORMATION

1.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

1.2 General Description of EUT

Product Name:	SX1262 868/915M LoRaWAN/GNSS HAT
Model:	SX1262 868/915M LoRaWAN/GNSS HAT
Serial Model:	SX1262 868/915M LoRaWAN HAT, Core1262-HF, Core1262-LF Pico-LoRa-SX1262-868M, Pico-LoRa-SX1262-915M, SX1262-LoRa-DTU-HF, SX1262-LoRa-DTU-HF-Kit, SX1262 868M LoRa HAT, SX1262 915M LoRa HAT
Power Rating:	Input: DC 5V/3A
Hardware Version:	N/A
Software Version:	N/A
Sample(s) Status:	AiTDG-250109017-1(Normal sample) AiTDG-250109017-2(Engineer sample)

Lora 125KHz(Hybrid):

Operation frequency:	902.3MHz~914.9MHz
Modulation:	LoRa
Channel number:	64
Channel separation:	200KHz
Antenna type:	External antenna
Antenna gain:	2.0 dBi

Lora 500KHz(DTS):

Operation frequency:	903MHz~914.2MHz
Modulation:	LoRa
Channel number:	8
Channel separation:	1.6MHz
Antenna type:	External antenna
Antenna gain:	2.0 dBi

Remark:

The above DUT's information was declared by manufacturer. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

1.3 Test Facility

Test Laboratory:

Guangdong Asia Hongke Test Technology Limited

B1/F, Building 11, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

The test facility is recognized, certified or accredited by the following organizations:

FCC-Registration No.: 251906 Designation Number: CN1376

Guangdong Asia Hongke Test Technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 31737 CAB identifier: CN0165

The 3m Semi-anechoic chamber of Guangdong Asia Hongke Test Technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 31737

A2LA-Lab Cert. No.: 7133.01

Guangdong Asia Hongke Test Technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

1.4 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Guangdong Asia Hongke Test Technology Limited's quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Asia Hongke laboratory is reported:

Test	Measurement Uncertainty	Notes
Power Line Conducted Emission	150KHz~30MHz ± 1.20 dB	(1)
Radiated Emission	9KHz~30Hz ± 3.10 dB	(1)
Radiated Emission	9KHz~1GHz ± 3.75 dB	(1)
Radiated Emission	1GHz~18GHz ± 3.88 dB	(1)
Radiated Emission	18GHz-40GHz ± 3.88 dB	(1)
RF power, conducted	30MHz~6GHz ± 0.16 dB	(1)
RF power density, conducted	± 0.24 dB	(1)
Spurious emissions, conducted	± 0.21 dB	(1)
Temperature	± 1 °C	(1)
Humidity	± 3 %	(1)
DC and low frequency voltages	± 1.5 %	(1)
Time	± 2 %	(1)
Duty cycle	± 2 %	(1)
Bandwidth	$\pm 1.5 \times 10^{-6}$	(1)

The report uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty Multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

2 Method of measurement

2.1 Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

FCC KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device, RF Exposure, Equipment Authorization Procedures

2.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

2.3 MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

2.4 Antenna Information

EUT can only use antennas certificated as follows provided by manufacturer;

Antenna	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
Lora	/	External Antenna	2.0	850-950MHz

2.5 Manufacturing Tolerance

Lora 125KHz(Hybrid):

Channel	Channel 00	Channel 32	Channel 63
Target (dBm)	22.0	22.0	22.0
Tolerance \pm (dB)	1.0	1.0	1.0

Lora 500KHz(DTS):

Channel	Channel 64	Channel 68	Channel 71
Target (dBm)	22.0	22.0	22
Tolerance \pm (dB)	1.0	1.0	1.0

2.6 Standalone MPE Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna is refer to section 4, the RF power density can be obtained.

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
Lora 125KHz	23	199.5262	2.0	1.5849	0.0629	0.6015
Lora 500KHz	23	199.5262	2.0	1.5849	0.0629	0.6020

Remark:

1. *Output power (Peak) including turn-up tolerance;*
2. *MPE evaluate distance is 20cm from user manual provide by manufacturer.*

2.7 Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

***** End of Report *****