RF EXPOSURE EVALUATION REPORT

Application No.:	GZCR2504000575AT
Applicant:	Guangzhou Robustel Co., Ltd.
Address of Applicant:	501, Building #2, 63 Yongan Road, Huangpu District, Guangzhou, China
Manufacturer:	Guangzhou Robustel Co., Ltd.
Address of Manufacturer:	501, Building #2, 63 Yongan Road, Huangpu District, Guangzhou, China
Factory:	Guangzhou Robustel Co., Ltd.
Address of Factory:	501, Building #2, 63 Yongan Road, Huangpu District, Guangzhou, China
Product Name:	Industrial LoRaWAN Gateway
Model No.:	R1520LG-AD-4L-A35GL, R1520LG-AD-NU ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	robustel
Standard(s) :	KDB 447498 D01 V06
	47 CFR Part 1.1310
Date of Receipt:	2025-04-21
Date of Evaluation:	2025-06-16
Date of Issue:	2025-07-18
Evaluation Result:	**Pass***

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

Ricky Liu
Manager

Revision Record			
Version	**Report No.**	**Date**	**Remark**
01	GZCR250400057506	2025-07-18	Original

Authorized for issue by:				
		Jim Li **Jim Li/Project Engineer**		
		Vico Cui **Vico Cui/Reviewer**		

2 Evaluation Summary

Item	Standard	Method	Requirement	Result
RF Exposure	KDB 447498 D01 V06	KDB 447498 D01 V06	47 CFR Part 1.1310	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

♣ **Declaration of EUT Family Grouping:**

Model No.: R1520LG-AD-4L-A35GL, R1520LG-AD-NU

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on the model name and LTE module (within in model R1520LG-AD-4L-A35GL but without in model R1520LG-AD-NU).

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4 General Information

4.1 Details of E.U.T.

Power supply:	Option 1: DC 9-60 V powered by AC/DC adapter as below: Model: GQ24-120150-AX Input: AC 100-240 V, 50/60Hz, 1.0 A Max Output: DC 12 V, 1.5 A, 18.0 W Option 2: PoE-PD: DC 42.5-57V
Cable(s):	For main unit: DC input ports USB ports ETH0(PoE) ports ETH1 ports Signal ports*6 For AC/DC adapter: AC plugs DC output cables (unshielded, 1.0m)
RF Parameter:	Please refer to test report GZCR250400057502 for BT Classic details Please refer to test report GZCR250400057503 for BT LE details Please refer to test report GZCR250400057504 for 2.4GHz Wi-Fi details Please refer to test report GZCR250400057505 for LoRa details Please refer to FCC ID: XMR202212EG25GL for GSM/WCDMA/LTE details except the antenna.
LTE Antenna Type:	SMA Connector with dedicated Dipole Antenna or Sucker Antenna
LTE Antenna Gain:	According to antenna specification: Option 1: Dipole Antenna 3.7 dBi Max from 700MHz to 960MHz 3.8 dBi Max from 1710MHz to 2690MHz Option 2: Sucker Antenna 2.4 dBi Max from 699MHz to 2690MHz
LTE Antenna Number:	2

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Evaluating Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,

No.198, Kezhu Road, Science City, Economic & Technological Development Area, Guangzhou, Guangdong, China 510663

Tel: +86 20 82155555

No tests were sub-contracted.

4.3 Facility

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

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

- **ISED (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

4.4 Deviation from Standards

None

4.5 Abnormalities from Standard Conditions

None

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5 Technical Requirements Specification

5.1 General Description of Applied Standards

KDB447498D01 General RF Exposure Guidance v06

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions,

by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

5.2 RF Exposure Evaluation

5.2.1 Limit & Test Method

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	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

Friis Formula

Friis transmission formula: $P_d = (P_{out}*G)/(4* P_i * R^2)$

Where

P_d = power density in mW/cm^2

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

P_i = 3.1416

R = distance between observation point and center of the radiator in cm

P_d id the limit of MPE, 1 mW/cm^2. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

5.2.2 Conclusion

Normal use condition for Distance between antenna and body: 30cm declared by applicant

For models R1520LG-AD-4L-A35GL and R1520LG-AD-NU

For BT Classic:

Antenna Gain: 4.55 dBi for Dipole Antenna

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2402	2.851	7.90	6.166	0.00155	1	Complies
2441	2.851	8.42	6.950	0.00175	1	Complies
2480	2.851	8.65	7.328	**0.00185**	1	Complies

Antenna Gain: 2.7 dBi for Sucker Antenna

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2402	1.862	7.90	6.166	0.00102	1	Complies
2441	1.862	8.42	6.950	0.00114	1	Complies
2480	1.862	8.65	7.328	0.00121	1	Complies

For BT LE:

Antenna Gain: 4.55 dBi for Dipole Antenna

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2402	2.851	5.45	3.508	0.00088	1	Complies
2440	2.851	5.83	3.828	0.00096	1	Complies
2480	2.851	5.96	3.945	**0.00099**	1	Complies

Antenna Gain: 2.7 dBi for Sucker Antenna

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2402	1.862	5.45	3.508	0.00058	1	Complies
2440	1.862	5.83	3.828	0.00063	1	Complies
2480	1.862	5.96	3.945	0.00065	1	Complies

For 2.4GHz Wi-Fi:

Antenna Gain: 4.55 dBi for Dipole Antenna

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2412	2.851	15.41	34.754	0.00876	1	Complies
2437	2.851	15.43	34.914	**0.00880**	1	Complies
2462	2.851	15.37	34.435	0.00868	1	Complies

Antenna Gain: 2.7 dBi for Sucker Antenna

Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2412	1.862	15.41	34.754	0.00572	1	Complies
2437	1.862	15.43	34.914	0.00575	1	Complies
2462	1.862	15.37	34.435	0.00567	1	Complies

For LoRa:

Antenna Gain: 3 dBi

Frequency (MHz)	Antenna Gain (Numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
904.3	1.995	11.25	13.34	0.00529	0.603	Complies
914.9	1.995	12.48	17.57	0.00703	0.610	Complies
927.5	1.995	13.42	21.98	**0.00872**	0.618	Complies

For model R1520LG-AD-4L-A35GL
For GSM/WCDMA/LTE:
Dipole Antenna:

Band	Frequency (MHz)	Distance (m)	Max Power (dBm)	Power (W)	Ant. Gain (dBi)	Ant. Gain (Numeric)	Power density (mW/cm^2)	Limit (mW/cm^2)	Result
GSM 850	824	0.3	26	0.3981	3.70	2.34	**0.0825**	0.55	Pass
PCS 1900	1850	0.3	23	0.1995	3.80	2.40	0.0423	1.00	Pass
WCDMA Band II	1850	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
WCDMA Band IV	1710	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
WCDMA Band V	824	0.3	25	0.3162	3.70	2.34	0.0655	0.55	Pass
LTE Band 2	1850	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
LTE Band 4	1710	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
LTE Band 5	824	0.3	25	0.3162	3.70	2.34	0.0655	0.55	Pass
LTE Band 7	2500	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
LTE Band 12	699	0.3	25	0.3162	3.70	2.34	0.0655	0.47	Pass
LTE Band 13	777	0.3	25	0.3162	3.70	2.34	0.0655	0.52	Pass
LTE Band 25	1850	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
LTE Band 26	814	0.3	25	0.3162	3.70	2.34	0.0655	0.54	Pass
LTE Band 38	2570	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
LTE Band 41	2496	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass
LTE Band 66	1710	0.3	25	0.3162	3.80	2.40	0.0671	1.00	Pass

Sucker Antenna:

Band	Frequency (MHz)	Distance (m)	Max Power (dBm)	Power (W)	Ant. Gain (dBi)	Ant. Gain (Numeric)	Power density (mW/cm^2)	Limit (mW/cm^2)	Result
GSM 850	824	0.3	26	0.3981	2.40	1.74	0.0612	0.55	Pass
PCS 1900	1850	0.3	23	0.1995	2.40	1.74	0.0307	1.00	Pass
WCDMA Band II	1850	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
WCDMA Band IV	1710	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
WCDMA Band V	824	0.3	25	0.3162	2.40	1.74	0.0486	0.55	Pass
LTE Band 2	1850	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
LTE Band 4	1710	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
LTE Band 5	824	0.3	25	0.3162	2.40	1.74	0.0486	0.55	Pass
LTE Band 7	2500	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
LTE Band 12	699	0.3	25	0.3162	2.40	1.74	0.0486	0.47	Pass
LTE Band 13	777	0.3	25	0.3162	2.40	1.74	0.0486	0.52	Pass
LTE Band 25	1850	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
LTE Band 26	814	0.3	25	0.3162	2.40	1.74	0.0486	0.54	Pass
LTE Band 38	2570	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
LTE Band 41	2496	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass
LTE Band 66	1710	0.3	25	0.3162	2.40	1.74	0.0486	1.00	Pass

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For model R1520LG-AD-4L-A35GL

The BT LE/Classic, 2.4GHz Wi-Fi, LoRa and GSM/WCDMA/LTE function can be transmitted simultaneously, so the result is 0.00185/1+0.00099/1+0.00880/1+0.00872/0.618+0.0825/0.55=0.291514<1, and the EUT meet the MPE requirement.

For model R1520LG-AD-NU

The BT LE/Classic, 2.4GHz Wi-Fi and LoRa function can be transmitted simultaneously, so the result is 0.00185/1+0.00099/1+0.00880/1+0.00872/0.618=0.14514<1, and the EUT meet the MPE requirement.

Note: Refer to report No. GZCR250400057502 to GZCR250400057505 and FCC ID: XMR202212EG25GL for EUT test Max Conducted Peak Output Power value.

6 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2504000575AT

- End of the Report -

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