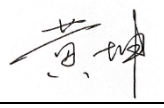
TEST REPORT

Applicant:	Queclink Wireless Solutions Co., Ltd.
EUT Description:	4G Industrial Router
Model:	WR100LNA
Brand:	Queclink
FCC ID:	YQD-WR100LNA
Standards:	FCC 47 CFR Part 2.1091
Date of Receipt:	2024/05/25
Date of Issue:	2024/06/13

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.



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Approved By:

Chen Chengfu
Reviewed By:

Revision History

Rev.	Issue Date	Description	Revised by
01	2024/06/13	Original	

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1 General Description

1.1 Lab Information

1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014
Tel.: +86-755-27212361
Contact Email: info@towewireless.com

1.1.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

ISED CAB identifier: CN0152
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0152
Company Number: 31000

1.2 Client Information

1.2.1 Applicant

Applicant:	Queclink Wireless Solutions Co., Ltd.
Address:	No.30, Lane 500, Xinlong Road，Minhang District, Shanghai, China, 201101

1.2.2 Manufacturer

Manufacturer:	Queclink Wireless Solutions Co., Ltd.
Address:	No.30, Lane 500, Xinlong Road，Minhang District, Shanghai, China, 201101

1.3 General Description of EUT

EUT Description:	4G Industrial Router
Model:	WR100LNA
Brand:	Queclink
Hardware Version:	V1.02
Software Version:	WR100_FCTR00A06V02
SN. or IMEI:	868260051937069
Antenna Type:	☒ External, ☐ Integrated, ☐ Others()
Antenna gain:	WCDMA Band 2: 3.71dBi
	WCDMA Band 4: 2.90dBi
	WCDMA Band 5: -1.47dBi
	LTE Band 2: 3.71dBi
	LTE Band 4: 2.90dBi
	LTE Band 5: -1.47dBi
	LTE Band 12: 0.45dBi
	LTE Band 13: 0.84dBi
	LTE Band 14: 0.84dBi
	LTE Band 66: 3.64dBi
	LTE Band 71: 0.45dBi
	Wi-Fi 2.4G: 1.09dBi
Remark: The above EUT's information was declared by applicant, please refer to the specifications or user manual for more detailed description.	

2 Maximum Permissible RF Exposure

2.1 RF Exposure Limit Introduction

§1.1310 the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b).

(1) Table 1 to § 1.1310(e)(1)sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fi elds.

Table 1 to § 1.1310(e)(1) - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strengtl (A/m)	Power density (mW/cm)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
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
1500~100000			5	<6
(ii) 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
1500~100000			1.0	<30

Note: f = frequency in MHz. * = Plane-wave equivalent power density.

(2) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of transient persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. In situations when an untrained person is transient through a location where occupational/controlled limits apply, he or she must be made aware of the potential for exposure and be supervised by trained personnel pursuant to § 1.1307(b)(2) of this part where use of time averaging is required to ensure compliance with the general population exposure limit. The phrase exercise control means that an exposed person is allowed and also knows how to reduce or avoid exposure by administrative or engineering work practices, such as use of personal protective equipment or time averaging of exposure.

(3) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. For example, RF sources intended for consumer use shall be subject to the limits for general population/uncontrolled exposure in this section.

The MPE was calculated at **20cm** to show compliance with the power density limit.

2.2 Equations

Power Density is given by:

$$S=\frac{EIRP}{4\pi R^2}$$

Where:
S = Power density in mW/cm^2
EIRP= Equivalent isotropic Radiated power in mW
R = Distance from transmitting antenna in cm

Power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by 10.

Distance:

$$R=\sqrt{\frac{EIRP}{4\pi S}}$$

Where:
S = Power density in mW/cm^2
EIRP= Equivalent isotropic Radiated power in mW
R = Distance from transmitting antenna in cm

EIRP:

$$EIRP = P+G$$

Where:
EIRP = Equivalent isotropic Radiated power in Mw
P = Output power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)

Source-Based Duty Cycle:
Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.
Source-based time-averaged EIRP = (DC / 100)* EIRP
Where:
DC = Duty Cycle in %, as applicable
EIRP= Equivalent isotropic Radiated power in mW

MIMO and collocated transmitters (identical limit for all transmitters):
For multiple chain devices, and collocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the PG (in linear units) of each transmitter.
Total EIRP = (EIRP 1) + (EIRP 2) + … + (EIRP n)

MIMO and collocated transmitters:
For multiple collocated transmitters operating simultaneously in frequency bands where different limit apply:
The power density at the specified separation distance is calculated for each transmitter chain or transmitter.
The fraction of the exposure limit is calculated for each chain or transmitter as
Power density of chain or transmitter / limit applicable to the chain or transmitter.
The fractions are summed.
Compliance is established if the sum of the fractions is less than or equal to one.

3 RF Exposure Results

3.1 Standalone Exposure Calculations

For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
The manufacturing configures output power so that the maximum power, after accounting for manufacturing tolerances, will never exceed the maximum power level measured.
The antenna gain in the tables below is the maximum antenna gain among various channels within the specified band.

Operating Band	Frequency (MHz)	Antenna Gain (dBi)	Max Conducted Average Output Power (dBm)	Output Power to Antenna (dBm)	EIRP(ERP) Limit (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Gain according to EIRP (dBi)	Gain according to Pd (dBi)	Max Gain Allowed (dBi)	Results
WCDMA B2	1852.4	3.71	25.00	28.71	33.00	316.2278	0.1478	1.0000	8.00	12.01	8.00	Pass
WCDMA B4	1712.4	2.90	25.00	27.90	30.00	316.2278	0.1227	1.0000	5.00	12.01	5.00	Pass
WCDMA B5	826.4	-1.47	25.00	23.53	38.45	316.2278	0.0448	0.5509	15.60	9.42	9.42	Pass
LTE B2	1880	3.71	25.00	28.71	33.00	316.2278	0.1478	1.0000	8.00	12.01	8.00	Pass
LTE B4	1710.7	2.90	25.00	27.90	30.00	316.2278	0.1227	1.0000	5.00	12.01	5.00	Pass
LTE B5	824.70	-1.47	25.00	23.53	38.45	316.2278	0.0448	0.5498	15.60	9.41	9.41	Pass
LTE B12	699.70	0.45	25.00	25.45	34.77	316.2278	0.0698	0.4665	11.92	8.70	8.70	Pass
LTE B13	779.50	0.84	25.00	25.84	34.77	316.2278	0.0763	0.5197	11.92	9.16	9.16	Pass
LTE B14	790.5	0.84	25.00	25.84	34.77	316.2278	0.0763	0.5270	11.92	9.23	9.23	Pass
LTE B66	1710.7	3.64	25.00	28.64	30.00	316.2278	0.1455	1.0000	5.00	12.01	5.00	Pass
LTE B71	665.5	0.45	25.00	25.45	34.77	316.2278	0.0698	0.4437	11.92	8.48	8.48	Pass
802.11b	2412	1.09	20.00	21.09	35.77	100.0000	0.0256	1.0000	15.77	17.01	15.77	Pass
802.11g	2412	1.09	18.00	19.09	36.77	63.0957	0.0161	1.0000	18.77	19.01	18.77	Pass
802.11n20	2412	1.09	18.00	19.09	37.77	63.0957	0.0161	1.0000	19.77	19.01	19.01	Pass
802.11n40	2422	1.09	17.00	18.09	38.77	50.1187	0.0128	1.0000	21.77	20.01	20.01	Pass

3.2 Multiple Sources Exposure Calculations

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of E2, H2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.
In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity.

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} \leq 1$$

Operating Band	Frequency (MHz)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Mes
WCDMA B2	1852.4	0.1478	1.0000	0.15
WCDMA B4	1712.4	0.1227	1.0000	0.12
WCDMA B5	826.4	0.0448	0.5509	0.08
LTE B2	1880	0.1478	1.0000	0.15
LTE B4	1710.7	0.1227	1.0000	0.12
LTE B5	824.70	0.0448	0.5498	0.08
LTE B12	699.70	0.0698	0.4665	0.15
LTE B13	779.50	0.0763	0.5197	0.15
LTE B14	790.5	0.0763	0.5270	0.14
LTE B66	1710.7	0.1455	1.0000	0.15
LTE B71	665.5	0.0698	0.4437	0.16
802.11b	2412	0.0256	1.0000	0.03
802.11g	2412	0.0161	1.0000	0.02
802.11n20	2412	0.0161	1.0000	0.02
802.11n40	2422	0.0128	1.0000	0.01

The worst-case combination:

Combination	*MEs*	Limit	Conclusion
LTE B71+802.11b	0.16+0.03=0.19	<1	PASS

~The End~