

TEST REPORT

Applicant: Queclink Wireless Solutions Co., Ltd.
Address: No.30, Lane 500, Xinlong Road, Minhang District,
Shanghai, China 201101
Equipment Type: GNSS Tracker
Model Name: GV57MG V2
Brand Name: Queclink
FCC ID: YQD-GV57MG
Test Standard: 47 CFR Part 2.1091
KDB 447498 D04 v01
Sample Arrival Date: May 08, 2023
Test Date: May 09, 2023 – May 17, 2023
Date of Issue: May 29, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

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Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>May 22, 2023</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>May 29, 2023</u>	<u>Update model name and bluetooth power assessment result.</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☒ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

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

2.2 Manufacturer Information

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

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	GNSS Tracker
Model Name Under Test	GV57MG V2
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V1.01
Software Version	R00A01V05
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	BPI
	Model No.	PL 40203
	Serial No.	N/A
	Capacity	190mAh
	Rated Voltage	3.7 V
	Limit Charge Voltage	4.23 V

2.6 Technical Information

Network and Wireless connectivity	2G Network GSM/GPRS/EDGE 850/900/1800/1900 MHz LTE Cat M1/NB2 Cat M1: Band 1/2/3/4/5/8/12/13/18/19/20/25/27/28/66/85 Cat NB2: Band 1/2/3/4/5/8/12/13/18/19/20/25/28/66/71/85 GPS, GLONASS, BeiDou, Bluetooth
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	GSM; LTE; Bluetooth		
Frequency Range	GSM 850	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	GSM 1900	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	LTE Band 2	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	LTE Band 4	TX: 1710 ~ 1755 MHz	RX: 2110 ~ 2155 MHz
	LTE Band 5	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	LTE Band 12	TX: 699 ~ 716 MHz	RX: 729 ~ 746 MHz
	LTE Band 13	TX: 777 ~ 787 MHz	RX: 746 ~ 756 MHz
	LTE Band 25	TX: 1850 ~ 1915 MHz	RX: 1930 ~ 1995 MHz
	LTE Band 66	TX: 1710 ~ 1780 MHz	RX: 2110 ~ 2180 MHz
	LTE Band 71	TX: 663 ~ 698 MHz	RX: 617 ~ 652 MHz
	LTE Band 85	TX: 698 ~ 716 MHz	RX: 728 ~ 746 MHz
	Bluetooth	2400 ~ 2483.5 MHz	
Antenna Type	WWAN	Omni Antenna	
	Bluetooth	PIFA Antenna	
Exposure Category	General Population/Uncontrolled Exposure		
EUT Type	Mobile Device		

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices
2	KDB 447498 D04 v01	447498 D04 Interim General RF Exposure Guidance v01

4 DEVICE CATEGORY AND LEVELS LIMITS

Mobile Device:

CFR Title 47 §2.1091(b)

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC KDB 447498 D04 General RF Exposure Guidance v01 Limit

Evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i. e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B. 2})$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).
The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
		5	10	15	20	25	30	35	40	45	50
300		39	65	88	110	129	148	166	184	201	217
450		22	44	67	89	112	135	158	180	203	226
835		9	25	44	66	90	116	145	175	207	240
1900		3	12	26	44	66	92	122	157	195	236
2450		3	10	22	38	59	83	111	143	179	219
3600		2	8	18	32	49	71	96	125	158	195
5800		1	6	14	25	40	58	80	106	136	169

5 ASSESSMENT RESULT

5.1 Output Power

Bluetooth			
Mode	Low Channel	Middle Channel	High Channel
Conducted Power (dBm)	-0.53	-0.57	-0.68
Antenna Gain (dBi)	2.10	2.10	2.10
EIRP (dBm)	1.57	1.53	1.42

Note: This table listed the worst case power value, please refer to BL-EC21C0778-601 report for more details.

GSM							
GSM850 Band	Burst Average Power(dBm)			Division Factors	Frame-Averaged power (dBm)		
Channel	128	190	251		128	190	251
GPRS (GMSK, 1-Slot)	32.95	33.30	33.14	9.19	23.76	24.11	23.95
GPRS (GMSK, 2-Slots)	31.41	31.76	31.74	6.13	25.28	25.63	25.61
GPRS (GMSK, 3-Slots)	29.87	29.57	29.53	4.42	25.45	25.15	25.11
GPRS (GMSK, 4-Slots)	28.29	28.12	28.41	3.18	25.11	24.94	25.23
GSM1900 Band	Burst Average Power(dBm)			Division Factors	Frame-Averaged power(dBm)		
Channel	512	661	810		512	661	810
GPRS (GMSK, 1-Slot)	30.89	30.76	30.35	9.19	21.70	21.57	21.16
GPRS (GMSK, 2-Slots)	29.35	29.22	29.42	6.13	23.22	23.09	23.29
GPRS (GMSK, 3-Slots)	28.38	27.89	28.01	4.42	23.96	23.47	23.59
GPRS (GMSK, 4-Slots)	26.96	26.79	26.91	3.18	23.78	23.61	23.73

GSM		
Mode	GSM850	GSM1900
Conducted Power (dBm)	25.63	23.96
Antenna Gain (dBi)	-0.76	-1.20
ERP/EIRP (dBm)	22.72	22.76

Note: This table listed the worst case power value, please refer to BL-EC2140498-501(G1) report for more details.

Mode	LTE-M1							
	Band2	Band4	Band5	Band12	Band13	Band25	Band66	Band85
Conducted Power (dBm)	22.98	22.79	22.80	22.83	22.66	22.50	22.48	22.49
Antenna Gain (dBi)	-1.20	-0.90	-0.76	-3.00	-0.81	-1.20	-0.90	-2.40
ERP/EIRP (dBm)	21.78	21.89	19.89	17.68	19.70	21.30	21.58	17.94

Note: This table listed the worst case power value, please refer to BL-EC2140498-501(G1) report for more details.

Mode	NB-IOT								
	Band2	Band4	Band5	Band12	Band13	Band25	Band66	Band71	Band85
Conducted Power (dBm)	22.40	22.39	22.37	22.34	22.37	22.30	22.31	21.88	22.29
Antenna Gain (dBi)	-1.20	-0.90	-0.76	-3.00	-0.81	-1.20	-0.90	-4.10	-2.40
ERP/EIRP (dBm)	21.20	21.49	19.46	17.19	19.41	21.10	21.41	15.63	17.74

Note: This table listed the worst case power value, please refer to BL-EC2140498-501(G1) report for more details.

5.2 Tune-up power

Mode	Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
BT	[-2.00, 0.00]	[0.10, 2.10]	[-2.05, -0.05]
GSM850	[24.00, 26.00]	/	[21.09, 23.09]
GSM1900	[22.00, 24.00]	[21.10, 23.10]	[18.95, 20.95]
LTE-M1 B2	[21.00, 23.00]	[19.80, 21.80]	[17.65, 19.65]
LTE-M1 B4	[21.00, 23.00]	[20.10, 22.10]	[17.95, 19.95]
LTE-M1 B5	[21.00, 23.00]	/	[18.09, 20.09]
LTE-M1 B12	[21.00, 23.00]	/	[15.85, 17.85]
LTE-M1 B13	[21.00, 23.00]	/	[18.04, 20.04]
LTE-M1 B25	[21.00, 23.00]	[19.80, 21.80]	[17.65, 19.65]
LTE-M1 B66	[21.00, 23.00]	[20.10, 22.10]	[17.95, 19.95]
LTE-M1 B85	[21.00, 23.00]	/	[16.45, 18.45]
NB-IOT B2	[21.00, 23.00]	[19.80, 21.80]	[17.65, 19.65]
LTE-M1 B4	[21.00, 23.00]	[20.10, 22.10]	[17.95, 19.95]
NB-IOT B5	[21.00, 23.00]	/	[18.09, 20.09]
NB-IOT B12	[21.00, 23.00]	/	[15.85, 17.85]
NB-IOT B13	[21.00, 23.00]	/	[18.04, 20.04]
NB-IOT B25	[21.00, 23.00]	[19.80, 21.80]	[17.65, 19.65]
NB-IOT B66	[21.00, 23.00]	[20.10, 22.10]	[17.95, 19.95]
NB-IOT B71	[20.00, 22.00]	/	[13.75, 15.75]
NB-IOT B85	[21.00, 23.00]	/	[16.45, 18.45]

Note1: ERP= EIRP -2.15dB

Note2: According KDB 447498 D04, used the greater of maximum conducted power and ERP to compare with the threshold value Pth.

5.3 RF Exposure Evaluation Result

Evolution mode	Frequency (MHz)	Maximum power (dBm)	Maximum power (mw)	Distance (mm)	Threshold Power (mW)	Power / Limit	Verdict
BT	2.48	0	1.00	200	3060.00	0.0003	Pass
GSM850	0.849	26	398.11	200	1731.96	0.2299	Pass
GSM1900	1.91	24	251.19	200	3060.00	0.0821	Pass
LTE-M1 B2	1.91	23	199.53	200	3060.00	0.0652	Pass
LTE-M1 B4	1.755	23	199.53	200	3060.00	0.0652	Pass
LTE-M1 B5	0.849	23	199.53	200	1731.96	0.1152	Pass
LTE-M1 B12	0.716	23	199.53	200	1460.64	0.1366	Pass
LTE-M1 B13	0.787	23	199.53	200	1605.48	0.1243	Pass
LTE-M1 B25	1.915	23	199.53	200	3060.00	0.0652	Pass
LTE-M1 B66	1.78	23	199.53	200	3060.00	0.0652	Pass
LTE-M1 B85	0.716	23	199.53	200	1460.64	0.1366	Pass
NB-IOT B2	1.91	23	199.53	200	3060.00	0.0652	Pass
LTE-M1 B4	1.755	23	199.53	200	3060.00	0.0652	Pass
NB-IOT B5	0.849	23	199.53	200	1731.96	0.1152	Pass
NB-IOT B12	0.716	23	199.53	200	1460.64	0.1366	Pass
NB-IOT B13	0.787	23	199.53	200	1605.48	0.1243	Pass
NB-IOT B25	1.915	23	199.53	200	3060.00	0.0652	Pass
NB-IOT B66	1.78	23	199.53	200	3060.00	0.0652	Pass
NB-IOT B71	0.698	22	158.49	200	1423.92	0.1113	Pass
NB-IOT B85	0.716	23	199.53	200	1460.64	0.1366	Pass

5.4 Collocated Power Calculation

Evolution mode	Frequency(MHz)	Power /Limit	$\Sigma(\text{Power / Limit})$ of WWAN + BT	Verdict
BT	2.48	0.0003	0.2302	Pass
Max WWAN	0.849	0.2299		

Note:

- $\Sigma(\text{Power / Limit})$: This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for BT+WWAN.
- Both of the BT+WWAN can transmit simultaneously, the formula of calculated the Power is $CP1 / LP1 + CP2 / LP2 + \dots \text{etc.} < 1$
 CP = Calculation power
 LP = Limit of power
- The worst-case situation is 0.2302, which is less than "1". This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
- More power list please refer to BL-EC21C0778-601 & BL-EC2140498-501(G1) test report.

5.5 Conclusion

This EUT is deemed to comply with the reference level limits, therefore the basic restrictions are compliant with human exposure limits.

Statement

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--END OF REPORT--