

TEST REPORT

Applicant: Ruijie Networks Co., Ltd.
Address: Building 19, Juyuanzhou Industrial Park, No. 618
Jinshan Road, Cangshan District, Fuzhou, Fujian,
China
Equipment Type: 1200M Dual Band Wi-Fi Range Extender
Model Name: RG-REX12
Brand Name: **REYEE**
FCC ID: 2AX5J-REX12
Test Standard: 47 CFR Part 2.1091
KDB 447498 D04
Test Date: Jul. 06, 2022 - Aug. 05, 2022
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ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

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Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

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

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, Guangdong Province, China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, Guangdong Province, China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Ruijie Networks Co., Ltd.
Address	Building 19, Juyuanzhou Industrial Park, No. 618 Jinshan Road, Cangshan District, Fuzhou, Fujian, China

2.2 Manufacturer Information

Manufacturer	Ruijie Networks Co., Ltd.
Address	Building 19, Juyuanzhou Industrial Park, No. 618 Jinshan Road, Cangshan District, Fuzhou, Fujian, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	1200M Dual Band Wi-Fi Range Extender
Model Name Under Test	RG-REX12
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/40) 5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80) U-NII-1/2A/2C/3
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	WLAN	
Frequency Range	802.11b/g	2400 ~ 2483.5 MHz
	802.11n(HT20/HT40)	2400 ~ 2483.5 MHz
	802.11a	5150 ~ 5350 MHz
		5470 ~ 5725 MHz
		5725 ~ 5850 MHz
	802.11n(HT20/HT40)	5150 ~ 5350 MHz
		5470 ~ 5725 MHz
		5725 ~ 5850 MHz
	802.11ac(VHT20/VHT40/VHT80)	5150 ~ 5350 MHz
		5470 ~ 5725 MHz
		5725 ~ 5850 MHz
Antenna Type	WLAN	Dipole Antenna
Exposure Category	General Population/Uncontrolled Exposure	
EUT Stage	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	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).

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

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

2.4G WIFI				
Mode	Main Antenna			
	802.11b	802.11g	802.11n20	802.11n40
Conducted Power (dBm)	17.02	15.67	15.46	10.72
Antenna Gain (dBi)	2.00			
EIRP (dBm)	19.02	17.67	17.46	12.72
Mode	Aux. Antenna			
	802.11b	802.11g	802.11n20	802.11n40
Conducted Power (dBm)	15.27	17.93	16.29	13.63
Antenna Gain (dBi)	2.00			
EIRP (dBm)	17.27	19.93	18.29	15.63
Mode	MIMO			
	802.11b	802.11g	802.11n20	802.11n40
Conducted Power (dBm)	--	18.23	17.64	14.40
Antenna Gain (dBi)	2.00			
EIRP (dBm)	--	20.23	19.64	16.40
Note: This report listed the maximal case conducted power value, please refer to RF report BL-SZ2261190-601 test report.				

5.2G WIFI						
Main Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	11.47	11.79	12.24	11.82	12.23	9.40
Antenna Gain (dBi)	3.00					
EIRP (dBm)	14.47	14.79	15.24	14.82	15.23	12.40
Aux. Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	10.74	10.83	11.41	10.96	10.70	6.42
Antenna Gain (dBi)	3.00					
EIRP (dBm)	13.74	13.83	14.41	13.96	13.70	9.42
MIMO						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	11.91	12.07	11.82	11.67	11.86	9.60
Antenna Gain (dBi)	3.00					
EIRP (dBm)	14.91	15.07	14.82	14.67	14.86	12.60
Note: This report listed the maximal case conducted power value, please refer to RF report BL-SZ2261190-602 test report.						

5.3G WIFI						
Main Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted (dBm)	21.40	21.32	18.54	21.22	17.49	11.67
Antenna Gain (dBi)	3.00					
EIRP (dBm)	24.40	24.32	21.54	24.22	20.49	14.67
Aux. Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	20.59	21.26	10.90	20.95	21.20	11.13
Antenna Gain (dBi)	3.00					
EIRP (dBm)	23.59	24.26	13.90	23.95	24.20	14.13
MIMO						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	20.59	20.85	19.42	20.83	18.88	9.98
Antenna Gain (dBi)	3.00					
EIRP (dBm)	23.59	23.85	22.42	23.83	21.88	12.98
Note: This report listed the maximal case conducted power value, please refer to RF report BL-SZ2261190-602 test report.						

5.6G WIFI						
Main Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	20.42	20.75	21.44	20.30	21.32	19.97
Antenna Gain (dBi)	3.00					
EIRP (dBm)	23.42	23.75	24.44	23.30	24.32	22.97
Aux. Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	20.82	20.32	21.13	20.46	21.19	21.78
Antenna Gain (dBi)	3.00					
EIRP (dBm)	23.82	23.32	24.13	23.46	24.19	24.78
MIMO						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	20.52	20.32	20.74	20.53	21.02	21.30
Antenna Gain (dBi)	3.00					
EIRP (dBm)	23.52	23.32	23.74	23.53	24.02	24.30
Note: This report listed the maximal case conducted power value, please refer to RF report BL-SZ2261190-602 test report.						

5.8G WIFI						
Main Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	22.58	22.93	24.41	23.03	24.87	20.44
Antenna Gain (dBi)	3.00					
EIRP (dBm)	25.58	25.93	27.41	26.03	27.87	23.44
Aux. Antenna						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	19.55	20.52	22.88	20.65	22.82	21.74
Antenna Gain (dBi)	3.00					
EIRP (dBm)	22.55	23.52	25.88	23.65	25.82	24.74
MIMO						
Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Conducted Power (dBm)	22.89	22.91	24.63	24.89	24.57	23.38
Antenna Gain (dBi)	3.00					
EIRP (dBm)	25.89	25.91	27.63	27.89	27.57	26.38
Note: This report listed the maximal case conducted power value, please refer to RF report BL-SZ2261190-602 test report.						

5.2 Turn-up power

Mode		Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
2.4G WIFI	Main Antenna	10.00-18.00	12.00-20.00	9.85-17.85
	Aux. Antenna	13.00-18.00	15.00-20.00	12.85-17.85
	MIMO	13.00-19.00	15.00-21.00	12.85-18.85
5.2G WIFI	Main Antenna	9.00-13.00	12.00-16.00	9.85-13.85
	Aux. Antenna	6.00-12.00	9.00-15.00	6.85-12.85
	MIMO	9.00-13.00	12.00-16.00	9.85-13.85
5.3G WIFI	Main Antenna	11.00-22.00	14.00-25.00	11.85-22.85
	Aux. Antenna	8.00-22.00	11.00-25.00	8.85-22.85
	MIMO	9.00-21.00	12.00-24.00	9.85-21.85
5.6G WIFI	Main Antenna	13.00-22.00	16.00-25.00	13.85-22.85
	Aux. Antenna	14.00-22.00	17.00-25.00	14.85-22.85
	MIMO	15.00-22.00	18.00-25.00	15.85-22.85
5.8G WIFI	Main Antenna	20.00-25.00	23.00-28.00	20.85-25.85
	Aux. Antenna	17.00-23.00	20.00-26.00	17.85-23.85

5.3 RF Exposure Evaluation Result

Evolution mode	Maximum output power (dBm)	Antenna Gain (typical) (dBi):	Maximum power (mw)	Distance (cm)	Threshold Power (mW)	Power / Limit	Verdict
2.4G WIFI	19.00	2.00	79.43	20	3060.00	0.03	Pass
5.2G WIFI	13.85	3.00	24.27	20	3060.00	0.01	Pass
5.3G WIFI	22.85	3.00	192.75	20	3060.00	0.06	Pass
5.6G WIFI	22.85	3.00	192.75	20	3060.00	0.06	Pass
5.8G WIFI	25.85	3.00	384.59	20	3060.00	0.13	Pass

5.4 Collocated Power Calculation

Evolution mode	Frequency(MHz)	Power /Limit	$\Sigma(\text{Power / Limit})$ of WLAN 2.4G + WLAN 5G	Verdict
2.4G WIFI	2400 ~ 2483.5 MHz	0.03	0.16	Pass
5.8G WIFI	5725 ~ 5850 MHz	0.13		Pass

Note: The largest WLAN 5G evaluation result is selected for simultaneous transmission calculation.

Note:

1. $\Sigma(\text{Power / Limit})$: This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for WLAN 2.4GHz+WLAN 5GHz.
2. Both of the 2.4GHz/5GHz 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
3. Both of the 2.4GHz WIFI and 5.8GHz WIFI can't transmit simultaneously at same time.
4. The worst-case situation is 0.16, which is less than "1". This confirmed that the device comply with KDB 447498 D04 limit.
5. The DUT work frequency range used is 2400 MHz ~ 2483.5 MHz and 5725 MHz ~ 5850 MHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.
6. More power list please refer to BL-SZ2261190-601 and BL-SZ2261190-602 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

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--