

TEST REPORT

Applicant: Shenzhen RAKwireless Technology Co., Ltd.
Address: Room 506, Building B, New Compark, Pingshan
First Road, Taoyuan Street, Nanshan District,
Shenzhen, Guangdong, China
Equipment Type: WisDuo Module
Model Name: RAK3112 (refer to section 2.3)
Brand Name: RAK
FCC ID: 2AF6B-3112
Test Standard: 47 CFR Part 2.1091
KDB 447498 D04 v01
Sample Arrival Date: Sep. 30, 2025
Test Date: Nov. 19, 2025
Date of Issue: Feb. 05, 2026

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Xiong Lining**Checked by:** Xu Rui**Approved by:** Tolan Tu
(Testing Director)

Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
<u>Rev. 01</u>	<u>Feb. 05, 2026</u>	<u>Initial Issue</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	Shenzhen RAKwireless Technology Co., Ltd.
Address	Room 506, Building B, New Compark, Pingshan First Road, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China

2.2 Manufacturer Information

Manufacturer	Shenzhen RAKwireless Technology Co., Ltd.
Address	Room 506, Building B, New Compark, Pingshan First Road, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China

2.3 General Description for Equipment under Test (EUT)

EUT Name	WisDuo Module
Model Name Under Test	RAK3112
Series Model Name	RAK3312
Description of Model name differentiation	The difference between RAK3112 and RAK3312 is that RAK3312 has an additional baseboard while RAK3112 do not. The baseboard is the extension of I/O. (this information provided by the customer)
Hardware Version	RAK3112_VC
Software Version	1.0.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth BLE WIFI 802.11b, 802.11g, 802.11n LoRa
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	WIFI, Bluetooth, LoRa	
Frequency Range	802.11b/g	2412 ~ 2462 MHz
	802.11n(HT20)	2412 ~ 2462 MHz
	Bluetooth	2402 ~ 2480 MHz
	LoRa	902 ~ 928 MHz
Antenna Type	WIFI	PCB Antenna
	Bluetooth	PCB Antenna
	LoRa	Dipole Antenna
		PCB Antenna
Exposure Category	General Population/Uncontrolled Exposure	
Product Type	Mobile Device	

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	KDB 447498 D04 v01	447498 D04 Interim General RF Exposure Guidance v01

3.2 Limit Standards

No.	Identity	Document Title
1	47 CFR Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices

4 DEVICE CATEGORY AND LEVELS LIMITS

Mobile Devices:

CFR Title 47 §2.1091(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

Mode	Bluetooth	2.4G WIFI	LoRa-DTS	LoRa-Hopping
Conducted Power (dBm)	-2.62	17.97	18.44	18.52
Antenna Gain (dBi)	3.12	3.12	2.30	2.30
ERP/EIRP (dBm)	0.50	21.09	18.59	18.67

Note: This report listed the worst case conducted power value, please refer to BL-SZ25A0043-601, BL-SZ25A0043-602, BL-SZ25A0043-603, BL-SZ25A0043-604 report for more details.

5.2 Tune-up power

Mode	Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
Bluetooth	[-3.00,-1.00]	[-1.00,1.00]	[-3.15,-1.15]
2.4G WIFI	[17.00,19.00]	[20.00,22.00]	[17.85,19.85]
LoRa-DTS	[17.00,19.00]	/	[16.85,18.85]
LoRa-Hopping	[17.00,19.00]	/	[16.85,18.85]

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	Maximum Power (dBm)	Maximum Power (mw)	Distance (mm)	Threshold Power (mW)	Power / Limit	Verdict
Bluetooth	-1.00	0.79	200	3060.00	0.0003	Pass
2.4G WIFI	19.85	96.61	200	3060.00	0.032	Pass
LoRa-DTS	19.00	79.43	200	1893.12	0.042	Pass
LoRa-Hopping	19.00	79.43	200	1893.12	0.042	Pass

5.4 Collocated Power Calculation

Evolution Mode	Power / Limit	$\Sigma(\text{Power} / \text{Limit})$ of Bluetooth + LoRa	Verdict
Bluetooth	0.0003	0.0423	Pass
Max LoRa	0.042		

Evolution Mode	Power / Limit	$\Sigma(\text{Power} / \text{Limit})$ of 2.4G WIFI + LoRa	Verdict
2.4G WIFI	0.032	0.074	Pass
Max LoRa	0.042		

Note:

1. $\Sigma(\text{Power} / \text{Limit})$: This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for Bluetooth + 2.4G WIFI + LoRa.
2. Both of the 2.4GHz/ LoRa/ Bluetooth can transmit simultaneously, the formula of calculated the Power is

$$\text{CP1} / \text{LP1} + \text{CP2} / \text{LP2} + \dots \text{etc.} < 1$$

CP = Calculation power
LP = Limit of power
3. The worst-case situation is 0.074, which is less than "1". This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
4. The DUT work frequency range used is 2400 MHz ~ 2483.5 MHz, 2412 MHz ~ 2462 MHz and 908 MHz ~ 928 MHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.
5. Bluetooth and 2.4G WIFI of this product cannot be transmitted simultaneously, so simultaneous transmission evaluation is not required for this 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.
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--END OF REPORT--