TEST REPORT

Applicant:	Thundercomm Technology Co., Ltd.
Address:	No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122
Equipment Type:	RUBIK Pi
Model Name:	RUBIK Pi 3 (refer to section 2.3)
Brand Name:	RUBIK Pi
FCC ID:	2AOHHRUBIKPI3
Test Standard:	47 CFR Part 2.1091 KDB 447498 D04 v01
Sample Arrival Date:	Dec. 17, 2024
Test Date:	Dec. 17, 2024 - Dec. 27, 2024
Date of Issue:	Jan. 24, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Lining **Checked by:** Xu Rui **Approved by:** Tolan Tu

(Testing Director)

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jan. 24, 2025	Initial Issue

TABLE OF CONTENTS

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	Thundercomm Technology Co., Ltd.
Address	No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122

2.2 Manufacturer Information

Manufacturer	Thundercomm Technology Co., Ltd.
Address	No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122

2.3 General Description for Equipment under Test (EUT)

EUT Name	RUBIK Pi
Model Name Under Test	RUBIK Pi 3
Series Model Name	RUBIK Pi 3 Lite
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the applicant)
Hardware Version	V02
Software Version	LE 1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A
Note: The product Memory designed with two different Hardware. Please find bellow detail: 1. The product comes in two memory configurations:8GB + 128GB and 4GB + 64GB. 2. The two memory chips are from different manufacturers.	

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n(HT20/40), 802.11ac(VHT20/40/80)

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	Bluetooth, WIFI	
Frequency Range	802.11b/g/n(HT20)	2412 ~ 2462 MHz
	802.11a/ /n(HT20/HT40) /ac(VHT20/VHT40/VHT80)	5150 ~ 5250 MHz
		5250 ~ 5350 MHz
		5470 ~ 5725 MHz
		5725 ~ 5850 MHz
	Bluetooth	2402 ~ 2480 MHz
Antenna Type	Bluetooth	PCB
	WIFI	PCB
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 ERP20cm in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

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

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 λ/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 Pth (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). Pth is given by Formula (B.2).

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

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	5.2G WIFI	5.3G WIFI	5.6G WIFI	5.8G WIFI
Conducted Power (dBm)	6.43	23.99	16.85	16.67	16.74	14.11
Antenna Gain (dBi)	-0.72	-0.72	4.61	4.66	4.88	4.90
EIRP (dBm)	5.71	23.27	21.46	21.33	21.62	19.01
Note: This table listed the worst case power value, please refer to BL-SZ24C0728-601, BL-SZ24C0728-602, BL-SZ24C0728-603, BL-SZ24C0728-604 report for more details.						

5.2 Tune-up power

Mode	Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
Bluetooth	[5.00, 7.00]	[5.00, 7.00]	[2.85, 4.85]
2.4G WIFI	[23.00, 25.00]	[22.00, 24.00]	[19.85, 21.85]
5.2G WIFI	[16.00, 18.00]	[20.00, 22.00]	[17.85, 19.85]
5.3G WIFI	[16.00, 18.00]	[20.00, 22.00]	[17.85, 19.85]
5.6G WIFI	[16.00, 18.00]	[20.00, 22.00]	[17.85, 19.85]
5.8G WIFI	[13.00, 15.00]	[18.00, 20.00]	[15.85, 17.85]
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	Frequency (MHz)	Maximum power (dBm)	Maximum power (mw)	Distance (mm)	Threshold Power (mW)	Power / Limit	Verdict
Bluetooth	2.483	7.00	5.01	200	3060.00	0.002	Pass
2.4G WIFI	2.462	25.00	316.23	200	3060.00	0.103	Pass
5.2G WIFI	5.250	19.85	96.61	200	3060.00	0.032	Pass
5.3G WIFI	5.350	19.85	96.61	200	3060.00	0.032	Pass
5.6G WIFI	5.725	19.85	96.61	200	3060.00	0.032	Pass
5.8G WIFI	5.850	17.85	60.95	200	3060.00	0.020	Pass

5.4 Collocated Power Calculation

Evolution mode	Frequency(MHz)	Power /Limit	Σ(Power / Limit) of BT+ WIFI	Verdict
Bluetooth	2400 ~ 2483.5 MHz	0.002	**0.105**	Pass
2.4G WIFI	2412 ~ 2462 MHz	0.103		

Note:

1. Σ(Power / Limit): This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for 2.4G WIFI +BT
2. Both of the 2.4G WIFI/BT can transmit simultaneously, the formula of calculated the Power is
   CP1 / LP1 + CP2 / LP2 + ……etc. < 1
   CP = Calculation power
   LP = Limit of power
3. The worst-case situation is 0.105, 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 ~ 2462 MHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.

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--