TEST REPORT

Applicant:	Arad Connectivity Co., Ltd.
Address:	5F.-1, No. 63, Sec. 1, Hangzhou S. Rd., Zhongzheng Dist., Taipei City 100022, Taiwan (R.O.C.)
Equipment Type:	MN52M series
Model Name:	MN52M
Brand Name:	Aradconn
FCC ID:	2BLIDMN52M
Test Standard:	47 CFR Part 2.1091 KDB 447498 D04 v01
Sample Arrival Date:	Oct. 11, 2024
Test Date:	Oct. 11, 2024 - Oct. 14, 2024
Date of Issue:	Nov. 19, 2024

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	Nov. 19, 2024	Initial Issue

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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	Arad Connectivity Co., Ltd.
Address	5F.-1, No. 63, Sec. 1, Hangzhou S. Rd., Zhongzheng Dist., Taipei City 100022, Taiwan (R.O.C.)

2.2 Manufacturer Information

Manufacturer	Arad Connectivity Co., Ltd.
Address	5F.-1, No. 63, Sec. 1, Hangzhou S. Rd., Zhongzheng Dist., Taipei City 100022, Taiwan (R.O.C.)

2.3 General Description for Equipment under Test (EUT)

EUT Name	MN52M series
Model Name Under Test	MN52M
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

2.4 Technical Information

Network and Wireless connectivity	Bluetooth: BLE 1M&2M

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

Operating Mode	Bluetooth: BLE 1M&2M	
Frequency Range	Bluetooth	2400 ~ 2483.5 MHz
Exposure Category	General Population/Uncontrolled Exposure	
Product Type	Mobile Device	

The prodcut MN52M is equipped with below antenna:

	Antenna type	Manufacturer	Antenna peak gain (dBi)
Antenna Information	Ceramics	Arad Connectivity Co., Ltd.	1.05
	PCB	Arad Connectivity Co., Ltd.	0.8
	Dipole	Pulse Electronics	2
	PCB	Pulse Electronics	3.3
	PCB	Pulse Electronics	2.3

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	KDB 447498 D04 v01	KDB 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

Bluetooth			
Mode	GFSK (BLE)		
	Low Channel	Middle Channel	High Channel
Peak Power (dBm)	4.63	4.66	4.41
Antenna Gain (dBi)	3.30	3.30	3.30
EIRP (dBm)	7.93	7.96	7.71
Note: This report listed the worst case power value, please refer to BL-SH2490725-601 report for more details.			

5.2 Tune-up power

Mode	Peak Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
Bluetooth	[4.00,5.00]	[7.30,8.30]	[5.15,6.15]
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	f(Ghz)	Maximum power (dBm)	Maximum power (mw)	Distance (mm)	Threshold Power (mW)	Verdict
Bluetooth	2.48	8.30	6.76	200	3060.00	Pass

Note:

1. The worst-case situation is 6.76mW, which is less than “3060mW”. This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
2. The DUT work frequency range used is 2400 MHz ~ 2483.5 MH the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.
3. More power list please refer to RF(BL-SH2490725-601) test report.

5.4 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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