

Prüfbericht-Nr.: Test report no.:	CN25D0FJ 001	Auftrags-Nr.: Order no.:	48256015	Seite 1 von 12 Page 1 of 12
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2024-12-19	
Auftraggeber: Client:	Doodle labs(SG) Pte Ltd 601 MacPherson Road, Grantral Complex, Suite 07-15, Singapore 368242, Singapore			
Prüfgegenstand: Test item:	Mesh Rider Radio			
Bezeichnung / Typ-Nr.: Identification / Type no.:	RM-2450-2L, RM-2025-2L, RM-2450-12M3, RM-2450-12M3-IN, RM-2025-62M3, RM-2025-62M3-IN, RM-2450-12M4, RM-2450-12M4-IN, RM-2025-62M4, RM-2025-62M4-IN, RM-1700-22M3, RM-1700-22M3-IN, RM-1700-22M4, RM-1700-22M4-IN, RM-2100-42M3, RM-2100-42M3-IN, RM-2100-42M4, RM-2100-42M4-IN, RM-2450-2LSX-SA-ST, RM-2025-2LMX-SA-ST			
Auftrags-Inhalt: Order content:	FCC Certification			
Prüfgrundlage: Test specification:	IEEE Std C95.1 47 CFR §2.1091 47 CFR §1.1310 KDB 447498 D04			
Wareneingangsdatum: Date of sample receipt:	2025-01-21			
Prüfmuster-Nr.: Test sample no.:	A003914831-001 A003914831-006 & 007			
Prüfzeitraum: Testing period:	2025-02-03 - 2023-02-20			
Ort der Prüfung: Place of testing:	EMC/RF Taipei Testing Site			
Prüflaboratorium: Testing laboratory:	Taipei Testing Laboratories			
Prüfergebnis*: Test result*:	Pass			
überprüft von: compiled by:	 Ryan Chen		genehmigt von: authorized by:	 Brenda Chen
Datum: Date:	2025-03-04	Ausstellungsdatum: Issue date:	2025-03-04	
Stellung / Position:	Senior Project Manager	Stellung / Position:	Senior Project Manager	
Sonstiges / Other:	This report is to add series models. Both RM-2450-2LSX-SA-ST and RM-2450-2L have Path Power Amplifier (PA) IC change. RM-2450-2LSX-SA-ST is just a label change variant for RM-2450-2L. Some components were replaced by 2nd source without affecting the electrical characteristics. For the model differences, please refer to section 3.2 for the details.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

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Anmerkungen
Remarks

- | | |
|----------|--|
| 1 | <p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.
Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p> |
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| 3 | <p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.
Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.
Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p> |
| 4 | <p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2023, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2023, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p> |

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APPENDIX EP - PHOTOGRAPHS OF EUT

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HISTORY OF THIS TEST REPORT

Revision	Description	Date Issued
R01	Original Release	2025-03-04

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix EP - Photographs of EUT

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2 Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F, No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 180491
ISED Registration No.: 25563

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a Mesh Rider Radio. It contains a 2.4GHz compatible module enabling the user to communicate data through a Wireless interface.

For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 Ratings and System Details

Basic Information of EUT

Item	EUT Information
Kind of Equipment/Test Item	Mesh Rider Radio
Type Identification	RM-2450-2L, RM-2025-2L, RM-2450-12M3, RM-2450-12M3-IN, RM-2025-62M3, RM-2025-62M3-IN, RM-2450-12M4, RM-2450-12M4-IN, RM-2025-62M4, RM-2025-62M4-IN, RM-1700-22M3, RM-1700-22M3-IN, RM-1700-22M4, RM-1700-22M4-IN, RM-2100-42M3, RM-2100-42M3-IN, RM-2100-42M4, RM-2100-42M4-IN, RM-2450-2LSX-SA-ST, RM-2025-2LMX-SA-ST
FCC ID	2AG87RM2450-2L

Technical Specification of EUT

Item	EUT Information
Operating Frequency	10MHz: 2412 MHz ~ 2467 MHz 20MHz: 2412 MHz ~ 2462 MHz
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Operation Voltage	5 Vdc
Antenna Information	Dipole Antenna (Refer to Notes as below for the details)

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Note:

1. All models are listed as below.

Report no.:	Model Type	Type Identification	Difference
CN2239JU (FCC-MPE) 001	Main	RM-2450-2L	All models are electrically identical, different model names are for marketing purpose.
	Series	RM-2025-2L	
CN2239JU (FCC-MPE) 002	Series	RM-2450-12M3	The changes made in new models is in the interface connector(s) and related PCB. The RF section and PCB remains the same.
		RM-2450-12M4	
		RM-2025-62M3	Equivalent to RM-2450-12M3 Same appearance and RF layout and function. The only difference is model name.
		RM-2025-62M4	Equivalent to RM-2450-12M4 Same appearance and RF layout and function. The only difference is model name.
CN25D0FJ 001	Series	RM-2450-12M3-IN	Equivalent to RM-2450-12M3 Same appearance and RF layout and function. The only difference is model name.
		RM-2025-62M3-IN	
		RM-2100-42M3	
		RM-2100-42M3-IN	
		RM-2450-12M4-IN	Equivalent to RM-2450-12M4 Same appearance and RF layout and function. The only difference is model name.
		RM-2025-62M4-IN	
		RM-2100-42M4	
		RM-2100-42M4-IN	
		RM-2450-2LSX-SA-ST	The change on RM-2450-2L and new models is 2.4GHz Path Power Amplifier (PA) IC change.
		RM-2025-2LMX-SA-ST	
		RM-2450-12M3	
		RM-2450-12M4	

2. The antenna information is as below.

Antenna Gain	Connector	Part No.	Vendor
2.2 dBi	RP-SMA	RN-SMA4-RP	Microchip
0.56 dBi	RP-SMA	RN-SMA-S-RP	Microchip

4 Maximum Permissible Exposure Evaluation

4.1 Introduction

This Standard specifies requirements for, and provides guidance on, assessing compliance with the exposure limits of radiofrequency (RF) safety standards such as IEEE Std C95.1. This includes methodologies for making an assessment (by measurement or computation) of human exposure to ambient RF fields and induced body currents in the frequency range of 0 kHz to 300 GHz.

This Standard may also be used as a guide for making low-level environmental exposure assessments in areas around RF sources listed above, as well as other sources such as Wi-Fi devices.

4.2 Reference Levels

Where appropriate, the reference levels are derived from the basic restrictions by mathematical modelling and by extrapolation from the results of laboratory investigations at specific frequencies. They are given for the condition of maximum coupling of the field to the exposed individual, thereby providing maximum protection.

According to FCC 1.1310, the criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

The FCC MPE limits from 47 CFR §1.1310 are shown in the table below

Frequency Range [MHz]	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm ²]	Average Time [minutes]
(A) Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	*100	6
3.0 – 30	1842/f	4.89/f	*900/f ²	6
30 – 300	61.4	0.163	1.0	6
300 – 1500			f/300	6
1500 – 100000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3 – 1.34	614	1.63	*100	30
1.34 – 30	824/f	2.19/f	*180/f ²	30
30 – 300	27.5	0.073	0.2	30
300 – 1500			f/1500	30
1500 – 100000			1.0	30

NOTE –

- (1) f is the frequency in MHz.
- (2) Provided that basic restrictions are met and adverse indirect effects can be excluded, field strength values can be exceeded. For the specific case of occupational exposures at frequencies up to 100 kHz, the derived electric fields can be increased by a factor of 2 under conditions in which adverse indirect effects from contact with electrically charged conductors can be excluded.
- (3) For frequencies between 100 kHz and 10 GHz, the quantities Seq, E2 and H2 are averages over any 6 minutes.
- (4) For frequencies exceeding 10 GHz, Seq, the quantities E2 and H2 are averages over any $68/f$ 1.05 minutes (f in GHz).

4.3 Classification of the Assessment Methods

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. So, this product under normal use is located on electromagnetic far field between the human body.

MPE Calculation Method according to KDB 447498 D04 Interim General RF Exposure Guidance v01

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 of § 1.1307(b)(1)(i)(C) to support an exemption from further evaluation from 300 kHz through 100 GHz.

The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES
SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	—	1.34	159 m	—	35.6 m	1,920 R ²
1.34	—	30	35.6 m	—	1.6 m	3,450 R ² / f^2
30	—	300	1.6 m	—	159 mm	3.83 R ²
300	—	1,500	159 mm	—	31.8 mm	0.0128 R ² / f
1,500	—	100,000	31.8 mm	—	0.5 mm	19.2R ²

Subscripts L and H are low and high; λ is wavelength.
 From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

5 Test Results

5.1 MPE-based Exemption

The Calculated at a distance of 20 cm are shown as below:

Frequency (MHz)	Average Output Power (dBm)	Tune-up Output Power (dBm)	Tune-up Output Power (mW)	Antenna Gain (dBi)	ERP (mW)	ERP Limit (mW)	Pass / Fail
2437	20.59	21.00	125.89	2.2	127.35	768	Pass

Conclusion

The device complies with the FCC exposure requirements since the maximum transmitter power density is below the FCC limit.