



SAR EVALUATION REPORT

**FCC 47 CFR § 2.1093
IEEE Std 1528-2013
RSS-102 Issue 5**

For

Controller with BLE transceiver

FCC ID: 2AM5N-ML2M2

IC Certification ID: 23045-ML2M2

Model Name: M2003000, M2103000, M2004000, M2104000, M2005000, M2105000

**Report Number: 13757234-S1V2
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Prepared for

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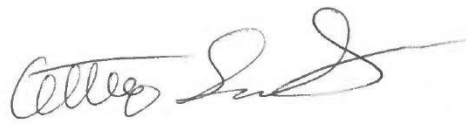
Revision History

Rev.	Date	Revisions	Revised By
V1	10/28/2021	Initial Issue	-
V2	11/8/2021	Section 5 – clarified 10 g exemption calculation	Dave Weaver

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1. Attestation of Test Results

Applicant Name	Magic Leap, INC.
FCC ID	2AM5N-ML2M2
IC Certification ID	23045-ML2M2
Model Name	M2003000, M2103000, M2004000, M2104000, M2005000, M2105000
Difference in Model Name	Models M2003000, M2103000, M2004000, M2104000, M2005000 and M2105000 are electrically identical. Six model numbers are allocated for marketing and logistic purposes only.
Applicable Standards	Published RF exposure KDB procedures IEEE Std 1528-2013 RSS-102 Issue 5
RF Exposure Conditions	Equipment Class DSS
Test Results	Compliant
<p>UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.</p> <p>The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.</p> <p>This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the U.S. Government, or any agency of the U.S. government.</p>	
Approved & Released By:	Prepared By:
	
Dave Weaver Operations Leader UL Verification Services Inc.	Coltyce Sanders Senior Test Engineer UL Verification Services Inc.

2. Test Specification, Methods and Procedures

All calculations were made in accordance with FCC KDB 447498 D01 v07 and RSS-102 Issue 5

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

47173 Benicia Street	47266 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1	SAR Lab 9
SAR Lab B	SAR Lab 2	SAR Lab 10
SAR Lab C	SAR Lab 3	SAR Lab 11
SAR Lab D	SAR Lab 4	SAR Lab 12
SAR Lab E	SAR Lab 5	SAR Lab 13
SAR Lab F	SAR Lab 6	
SAR Lab G	SAR Lab 7	
SAR Lab H	SAR Lab 8	

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05

4. Device Under Test (DUT) Information

4.1. DUT Description

The DUT is an optical handheld operated input device with a BLE radio transceiver. The antenna to user separation distance was assumed to be 0 mm as this is the most conservative condition.

4.2. Wireless Technologies and Maximum Output Power

Wireless Technology	Frequency Band	Maximum Output Power		Antenna Gain dBi	E.I.R.P		E.R.P	
		dBm	mW		dBm	mW	dBm	mW
Bluetooth LE	2.4 GHz	8.5	7	1	9.50	9	7.35	5

Notes:

E.I.R.P = Maximum Output Power + Antenna Gain

E.R.P = E.I.R.P – 2.15

5. FCC Standalone SAR Test Exclusion Considerations

Per KDB 447498 D01 v07 Appendix B.4:

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

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).

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

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

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).

For 10 g SAR P_{th} is generated by multiplying the calculated value by 2.5.

SAR based exemption for BLE was calculated at a test distance of 5mm. The higher of maximum conducted power or E.R.P is used in the calculation. The maximum Bluetooth power is 7mW and the E.R.P is 5mW (Refer to §4.2). Therefore, the conducted power was used to determine SAR exclusion.

Bluetooth SAR Exemption Calculations

RF Air Interface	Frequency (GHz)	ERP _{20cm} (mW)	distance (cm)	P_{th} (10 g) (mW)
BLE	2.48	3060.0	0.5	7

Notes:

The calculated Power threshold (P_{th}) for BLE is 7 mW. The conducted power (7 mW) is $\leq P_{th}$ therefore SAR testing is not required.

6. ISED Standalone SAR Test Exclusion Considerations

SAR test exemption from routine evaluation was determined in accordance with RSS-102 §2.5.1. When 10g value applies, the exemption limits for routine evaluation in Table 1 of RSS 102 Issue 5 §2.5.1, are multiplied by a factor of 2.5.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

At an operating frequency of 2450 MHz, the Exemption Limit for SAR test exclusion for 10g extremity is 10 mW (4 mW*2.5). If the conducted power or E.I.R.P (whichever is highest of the two) is less than the 10 g SAR test exemption limit then SAR testing is not required.

RF Air Interface	Frequency (MHz)	Output Power		Antenna Gain (dBi)	E.I.R.P		Separation Distance (mm)	Exemption Limit (mW)	SAR Test Required?
		dBm	mW		dBm	mW			
BLE	2480.0	8.5	7	1.0	9.5	9	5	10	No

Notes:

As the maximum output power is 7 mW conducted and 9 mW EIRP, this device qualifies for SAR test exclusion per RSS 102 Issue 5 §2.5.1.

END OF REPORT