

# RF Exposure Lab

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## CERTIFICATE OF COMPLIANCE RF EXPOSURE & NERVE STIMULATION EVALUATION

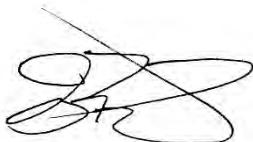
Avid Identification Systems, Inc.  
3185 Hamner Avenue  
Norco, CA 92860

Dates of Test: May 28, 2025  
Test Report Number: SAR.20250514  
Revision A  
Lab Designation Number: US1195

FCC ID:	IOL-134-AV1053
Contains FCC ID:	IOL-BT40F
Model(s):	MiniTracker 4 Wand
Serial Number:	Eng 1
Equipment Type:	Handheld RFID Reader With BT
Classification:	RFID & BT Transmitter
TX Frequency Range:	134 KHz, 2402 – 2480 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	134 KHz – 33.6 dBm EIRP, 2450 MHz – 9.4 dBm ERP
Signal Modulation:	ASK, GMSK
Antenna Type:	Internal
Application Type:	Certification
Standard(s):	KDB680106 D01 v04
Maximum E-Field	265.97 V/m
Maximum H-Field	1.21 A/m
Simultaneous Evaluation:	0.7795 Total Exposure Ratio
Distance to Probe:	0 mm

This wireless mobile device has been shown to meet the requirements for RF exposure testing and Nerve Stimulation for uncontrolled environment/general exposure limits specified in above listed standards. The device has also been shown to meet the simultaneous requirements of each standard as well (See test report).

I attest to the accuracy of the data. I assume full responsibility for the completeness of these calculations and vouch for the qualifications of all persons making them.



Jay M. Moulton  
Vice President



Testing Certificate # 2387.01

## Table of Contents

1. Introduction.....	4
2. Radiation Sources .....	4
3. MiniTracker 4.....	5
4. RF Exposure Classifications .....	6
5. RF Exposure Limits.....	7
FCC Requirements .....	7
6. General Conditions .....	8
7. Environmental Conditions .....	8
8. Test Equipment.....	8
9. EUT Description.....	9
10. Nerve Stimulation Evaluation Results 134 kHz.....	10
11. Simultaneous Evaluation.....	14
Appendix A – Calibration Certificates.....	15

Comment/Revision	Date
Original Release	June 11, 2025
Revision A – Correct the distance for the H-Field in the table on page 10	July 1, 2025

**Note: The latest version supersedes all previous versions listed in the above table. The latest version shall be used.**

## 1. Introduction

This report shows the RF exposure evaluation of the Avid Identification Solutions, Inc. Model MiniTracker 4 Handheld RFID Reader with BT with KDB680106 D01 v04.

## 2. Radiation Sources

Radio	Description	
134 kHz	Frequency (MHz)	134 kHz
	Maximum Power (dBm)	33.6 dBm (EIRP)
	Maximum Duty Cycle (%)	100%
2450 MHz	Frequency (MHz)	2450 MHz
	Maximum Power (dBm)	9.4 dBm (ERP)
	Maximum Duty Cycle (%)	100%

**Note: The Bluetooth transmitter is excluded from SAR testing based on KDB447498 D01 v06. The calculation is show below on page 14. The simultaneous evaluation is show on page 14.**

### 3. MiniTracker 4



**Testing Position**

## 4. RF Exposure Classifications

Device Types	
Fixed	A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located.
Mobile	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. (47 CFR 2.1091)
Portable	A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. (47 CFR 2.1093)

Exposure Categories	
Occupational / Controlled	Limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
General population / uncontrolled	Exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

## 5. RF Exposure Limits

### FCC Requirements

The RF exposure limits, as set forth in § 1.1310, do not cover the frequency range below 100 kHz for Specific Absorption Rate (SAR) and below 300 kHz for Maximum Permitted Exposure (MPE). In addition, present limitations of RF exposure evaluation systems prevent an accurate evaluation of SAR below 4 MHz. For these reasons, a specific MPE-based RF Exposure compliance procedure for devices operating in the aforementioned low-frequency ranges has been set in place. This procedure is applicable to Equipment Authorization of all RF devices, thus including, but not limited to, Part 18 and WPT devices.

Accordingly, for § 2.1091-Mobile devices, the MPE limits between 100 kHz to 300 kHz are to be considered the same as those at 300 kHz in Table 1 of § 1.1310, that is, 614 V/m and 1.63 A/m, for the electric field and magnetic field, respectively. For § 2.1093-Portable devices below 4 MHz and down to 100 kHz, the MPE limits in § 1.1310 (with the 300 kHz limit applicable all the way down to 100 kHz) can be used for the purpose of equipment authorization in lieu of SAR evaluations.

Table 1 to § 1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(i) Limits for Occupational/Controlled Exposure</b>				
0.3–3.0	614	1.63	*(100)	≤6
3.0–30	1842/f	4.89/f	*(900/f <sup>2</sup> )	<6
30–300	61.4	0.163	1.0	<6
300–1,500			f/300	<6
1,500–100,000			5	<6
<b>(ii) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34	614	1.63	*(100)	<30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	<30
30–300	27.5	0.073	0.2	<30
300–1,500			f/1500	<30
1,500–100,000			1.0	<30

f = frequency in MHz. \* = Plane-wave equivalent power density.

## 6. General Conditions

- This report is only in reference to the item that has undergone the assessment.
- This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.

## 7. Environmental Conditions

The following limits were not exceeded during the test:

Temperature	Min. = 15 °C
	Max. = 35 °C
Relative Humidity	Min. = 30%
	Max. = 60%

## 8. Test Equipment

	Serial Number	Last Cal. Date	Cal. Due Date	Probe Diameter
• Wavecontrol SMP2	19SN1179	04/15/2024	04/15/2026	
• WP400-3	19WP120054	04/15/2024	04/15/2026	27 mm
• Positioning Apparatus used is a plastic tripod to hold the meter and probe at a specified position, a camera motion device is installed on the tripod to make precise positions at 10 mm steps away from the EUT				
• Testing was conducted in a shielded room with the EUT sitting on a wooden table.				
• A DC power source was used to supply the power to the EUT.				
• The probes meet the requirements set forth in RSS-102.NS.MEAS Issue 1 sections 5.3.5 as required by table A2				

## 9. EUT Description

The MiniTracker 4 is an RFID Reader that is to be used to for animal reading manufactured by Avid Identification Solutions, Inc. The Reader provides RFID reader capability to track and identify animals. There are two transmitters in the device (RFID at 134 kHz and BT at 2450 MHz). The transmitters can be transmitting simultaneously; therefore, simultaneous evaluation is required and evaluated below on page 14.

For the measurements, the device had a test code to set the transmitter to full power 100% duty cycle for testing. The testing at each measurement point was conducted for 1 minute to ensure the maximum power was detected.

The description of the antenna is listed below

- There are two antennas in the device one for the 134 kHz and one for 2450 MHz transmitters
- The element is a 93 turn coil antenna for the 134 kHz transmitters with an impedance of  $15.6 \Omega$  &  $2.25 \text{ mH}$
- The BT antenna is a PCB Trace antenna with a gain of 0.34 dBi.
- The shielding or field shaping is not applicable
- The overall dimensions of the wand is 56 cm x 12.5 cm x 1.7 cm
- The overall dimensions of the handheld is 20 cm x 8 cm x 2 cm
- The distance from the antenna to the outside of the enclosure is 2.5 mm
- The position of the antenna in the device is located at the top of the wand
- The enclosure over the antenna is Acrylonitrile Butadiene Styrene (ABS)
- $D_s$  of the transmitting antenna is 11 cm diameter

## 10. Nerve Stimulation Evaluation Results 134 kHz

The measurements for the MiniTracker was conducted at 20 mm distance from the device to the center of the probe diameter. A pre-scan of the around the antenna was conducted first by moving the probe around all areas of the device being tested. The movement was conducted at a very slow pace to find the peak value for the device. Once the peak position was determined for the device, the meter and probe were installed on the positioning apparatus for conducting the final measurements. The location of the highest value was at x=15 mm, y=-58 mm, z=20 mm. The grid is based on the center of the antenna being 0,0,0 mm.

Below are all the measured values for the E- and H-field. All evaluations were conducted with a 95% confidence.

E-field		H-field	
Distance	Measured Value	Distance	Measured Value
<hr/>			
20 mm	241.70	20 mm	0.957
30 mm	186.70	30 mm	0.706
40 mm	166.70	40 mm	0.557
50 mm	144.50	50 mm	0.414
60 mm	134.90	60 mm	0.329
70 mm	129.90	70 mm	0.265
80 mm	116.40	80 mm	0.230
90 mm	109.50	90 mm	0.201
100 mm	99.00	100 mm	0.183
110 mm	98.10	110 mm	0.170
120 mm	75.30	120 mm	0.161
130 mm	67.70	130 mm	0.156
140 mm	65.20	140 mm	0.153
150 mm	62.80	150 mm	0.150

The highest value of all the sides at 20 mm was then tested at 20 mm moving away from the device every 10 mm. All the values were used to extrapolate to the 0 mm distance. The equation used to extrapolate the value to zero is the second degree polynomial  $y = a_2x^2 + a_1x + a_0$ , where  $x$  is the distance and  $y$  is the extrapolated value. This form of regression is quadradic regression decay. This evaluation is evaluating the value down to 0 mm using the first measurement at 20 mm.

The extrapolated value at 10 mm is 241.35 V/m.

The extrapolated value at 0 mm is 265.97 V/m.

*Regression Statistics*

Multiple R	0.979849246
R Square	0.960104545
Adjusted R Square	0.952850826
Standard Error	11.16796675
Observations	14

The extrapolated value at 10 mm is 1.03 A/m.

The extrapolated value at 0 mm is 1.21 A/m.

*Regression Statistics*

Multiple R	0.983278708
R Square	0.966837018
Adjusted R Square	0.960807385
Standard Error	0.048917536
Observations	14

The highest value of all the sides at 20 mm was then tested at 50 mm moving away from the device every 10 mm. All the values were used to extrapolate to the 0 mm distance. The equation used to extrapolate the value to zero is the second degree polynomial  $y = a_2x^2 + a_1x + a_0$ , where  $x$  is the distance and  $y$  is the extrapolated value. This form of regression is quadradic regression decay. This evaluation shows the verification of the extrapolation using the data from 50 mm on to compare a calculated value with a measured value.

The extrapolated value at 40 mm is 177.2 V/m.

The extrapolated value at 20 mm is 218.3 V/m.

The measured value at 40 mm is 166.7 V/m

The measured value at 20 mm is 241.7 V/m

The E-Field comparison is within 10%.

The extrapolated value at 40 mm is 0.59 A/m.

The extrapolated value at 20 mm is 0.87 A/m.

The measured value at 40 mm is 0.56 A/m.

The measured value at 20 mm is 0.96 A/m.

The H-Field comparison is within 10%.

Table of Regression Statistics				
	Multiple R	R ^ 2	Adjusted R ^ 2	Standard Error
Quadratic E-Field	0.979849246	0.960104545	0.952850826	11.16796675
Quadratic H-Field	0.983278708	0.966837018	0.960807385	0.048917536

The Interpolated Values		
	E-Field	H-Field
Quadratic	265.97	1.21

Frequency	E-Field Measurement	Limit [V/m]	% Limit	Verdict
134 kHz	265.97	614	43.3	Pass

Frequency	H-Field Measurement	Limit [A/m]	% Limit	Verdict
134 kHz	1.21	1.63	74.2	Pass

## 11. Simultaneous Evaluation

The BLE is excluded from SAR testing. Therefore, the BLE transmitter is estimated based on KDB 447498 D01 v06 section 4.3.2 b) 1). The equation is listed below.

$[(\text{max power, mW}) / (\text{min distance, mm})] * [\sqrt{f_{\text{GHz}}} / x]$ , where  $x = 18.75$  for 10-g extremity SAR

$$[8.7 \text{ mW}/5 \text{ mm}] * [\sqrt{2.48}/18.75] = 0.15 \text{ W/kg}$$

The ratio of the BLE to the SAR limit is  $0.15/4.0 = 0.0375$

The highest ratio of the 134 kHz transmitter measurements is the H-Field at 0.742.

The total exposure ratio is the sum of the two transmitters which is  $0.742 + 0.0375 = 0.7795$ .

To be compliant with the simultaneous transmission of the two transmitters, the TER must be less than 1.0. The TER is less than 1.0, therefore, the simultaneous transmission is compliant.

## Appendix A – Calibration Certificates



# Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 240411-151731-99c41b



**Model Number** WP400-3; SMP2  
**Manufacturer** Wavecontrol  
**Description** Field Probe  
**Serial Number** 19WP120054; 19SN1179  
**Customer Asset No.** N/A

**Customer**  
RF Exposure Lab, LLC  
802 N. Twin Oaks Valley Rd  
Suite 105  
San Marcos, CA 92069  
USA

**Date of Calibration** 04/15/2024  
**Temperature** 24°C  
**Humidity** 30% RH

**Location of Calibration**  
Keysight Technologies Inc.  
1346 Yellowwood Road  
Kimballton, IA 51543  
United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

**Calibration Standard(s)**  
IEEE Std 1309-2013

**Calibration Method(s)**  
Substitution

**Calibration Procedure(s)**  
909579

**Calibration Software**  
Probe Comparison 1.5.2

## As Received Conditions

The measured values of the equipment were observed in specification at the points tested.

## Action Taken

No action was taken.

## As Completed Conditions

The measured values of the equipment were observed in specification at the points tested.

## Calibration Due

Based on the customer's request, the next calibration is due on 15 Apr 2026

## Remarks or Special Requirements

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Keysight Technologies, Inc.  
1346 Yellowwood Road  
Kimballton, IA 51543  
United States

Issue Date 16 Apr 2024

  
Brandt Langer Iowa Service Center Manager

Page 1 of 4



# Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 240411-151731-99c41b



## Traceability Information

Technician Name      Dave Grabill

Measurements are traceable to the International System of Units (SI) via national metrology institutes ([www.keysight.com/find/NMI](http://www.keysight.com/find/NMI)) that are signatories to the CIPM Mutual Recognition Arrangement.

## Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
Agilent Technologies, Inc.	33250A	Function/Arbitrary Waveform Generator	11101	06/30/2024	230601-152459-8b26d8
AR	350AH1	Amp	11453	NA	NA
Hewlett-Packard	8563E	Spectrum Analyzer	2084	11/30/2024	231026-133128-431894
Combinova	FD1	Field Detector	10348	01/31/2025	240117-073922-a02261
Combinova	FD2	Field Detector	10347	02/28/2025	240202-080515-3d46de
Schwarzbeck Mess-Elektronik	FESP 5133-7/41	Loop	11285	10/31/2024	231026-131402-6bd9de
Schwarzbeck Mess-Elektronik	HHS 5204-12	Helmholtz Coil	11091	NA	NA
Holaday	HI-3624	ELF Magnetic Field Meter	10569	09/30/2024	230915-073549-c990d5
Holaday	HI-3627	ELF Magnetic Field Meter	10570	03/31/2025	240312-074557-4a2507

## Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

## In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a +/- 3 dB specification.

## Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$  such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of  $k=2$  for a normal distribution.

Parameter	Range	MU (+/-)
Magnetic Field Strength Meters - AC	0.20 mG to 20 G	0.33% + 1.2 mG

Customer Name: RF Exposure Lab, LLC

Probe Manufacturer: Wavecontrol

Probe Model: WP400-3; SMP2

Probe Serial No.: 19WP120054; 19SN1179

Notes:

CAL CERT #: 240411-151731-99c41b

## Magnetic Field

Linearity - 50Hz							
B Field (uT)	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean
750	0.99	-0.12	0.99	-0.11	0.99	-0.12	0.99
500	0.97	-0.23	0.97	-0.24	0.97	-0.25	0.97
250	1.01	0.10	1.01	0.07	1.01	0.06	1.01
100	0.98	-0.16	0.98	-0.17	0.98	-0.19	0.98
50	1.00	0.02	1.00	-0.02	0.98	-0.19	0.99
10	1.05	0.43	1.04	0.33	1.03	0.22	1.04
5	0.96	-0.38	0.96	-0.31	0.94	-0.52	0.95

## Frequency Response

10Hz-2kHz: 100uT / 10-200kHz: 25uT

Freq Hz	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean
10	1.07	0.59	1.06	0.51	1.06	0.50	1.06
30	1.00	0.04	1.00	-0.01	1.00	0.01	1.00
60	0.98	-0.16	0.98	-0.17	0.98	-0.20	0.98
100	0.98	-0.22	0.98	-0.21	0.97	-0.22	0.98
500	1.01	0.08	1.01	0.07	1.00	-0.02	1.01
1000	0.99	-0.09	0.99	-0.08	0.98	-0.17	0.99
2000	0.99	-0.06	0.99	-0.08	0.99	-0.12	0.99
10000	0.85	-1.41	0.85	-1.38	0.85	-1.38	0.85
100000	0.84	-1.48	0.84	-1.52	0.85	-1.45	0.84
200000	0.81	-1.84	0.81	-1.87	0.80	-1.90	0.81

Customer Name: RF Exposure Lab, LLC

Probe Manufacturer: Wavecontrol

Probe Model: WP400-3; SMP2

Probe Serial No.: 19WP120054; 19SN1179

Notes:

CAL CERT #: 240411-151731-99c41b

## Electric Field

Linearity - 50Hz							
E Field (V/m)	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean
350	1.00	-0.02	0.99	-0.05	1.00	-0.02	1.00
250	1.00	-0.01	1.00	0.03	1.00	0.04	1.00
100	1.01	0.05	1.01	0.08	1.01	0.05	1.01
50	1.03	0.24	1.02	0.16	1.02	0.15	1.02
20	1.02	0.14	1.01	0.12	1.02	0.18	1.02

## Frequency Response

25Hz-100kHz: 350V/m / 10Hz, 200-400kHz: 300V/m

Freq Hz	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean
10	1.23	1.83	1.23	1.80	1.24	1.84	1.23
25	1.12	0.96	1.12	0.98	1.12	0.98	1.12
50	1.00	-0.02	1.00	-0.02	1.00	-0.03	1.00
100	0.99	-0.08	0.99	-0.09	0.99	-0.09	0.99
500	0.99	-0.08	0.99	-0.09	0.99	-0.08	0.99
1000	0.98	-0.21	0.98	-0.20	0.97	-0.23	0.98
2000	1.02	0.18	1.02	0.16	1.02	0.14	1.02
10000	1.02	0.20	1.02	0.19	1.02	0.19	1.02
100000	1.04	0.32	1.04	0.32	1.04	0.32	1.04
200000	1.02	0.17	1.02	0.16	1.02	0.16	1.02
300000	1.02	0.19	1.02	0.19	1.02	0.18	1.02
400000	1.06	0.49	1.06	0.51	1.06	0.48	1.06