# APPLIED TEST LAB INC.



## FCC RF EXPOSURE EVALUATION REPORT

## Limits Applied: 47.CFR § 1.1310

## Report#: P001E003-66

**Manufacturer:** Phidgets Inc.

**Model:** Phidget 125 kHz RFID Reader/Writer 1024_1

**Serial Number:** 374295

**EUT Received Date:** 2020-03-06

**Test Start Date:** 2023-11-28

**Test Completion Date:** 2024-02-28

**Test Result:** PASS

**Report Issue Date:** 2024-04-30

| Tested by | Approved by: |
|---|---|
| Jaeheon Yun, Test specialist | Adiseshu Nyshadham, Quality Prime |
| Jaeheon | AdiSeshuN |

| Report Issued to | Report Issued by |
|---|---|
| Phidgets Inc.<br>Unit 1, 6115 - 4 Street S.E.,<br>Calgary, Alberta, Canada | Applied Test Lab Inc.<br>Unit 4174-3961 52 Ave NE<br>Calgary, AB, T3J 0J8 |

**Report Revision History**

| Rev | Description of Change | Date |
|---|---|---|
| Draft01 | Initial | 2024-04-30 |
| Release | Title page and information(Page 1 – 13) | 2024-04-30 |
| | | |



This report contains **13** pages

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# 1.0 General

## 1.1 Purpose

The purpose of this report is to document conformance with **47.CFR § 2.1091** and to detail the results of testing/evaluation performed on the sample Model: **Phidget 125 kHz RFID Reader/Writer 1024_1** manufactured by **Phidgets Inc.**. The test sample was received in good condition. Testing began **2023-11-28** on and was completed on **2024-02-28**.

## 1.2 Relevant Standards and References

One or more of the following standards were used to evaluate the EUT:

1. **ETSI EN 300 330 V2.1.1(2017-02):** Short Range Devices(SRD); Radio equipment in the frequency range 9kHz to 25MHz and inductive loop systems in the frequency range 9kHz to 30MHz; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU
2. **EN 62311:2008** - Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
3. ICNIRP Guidelines (Published in Health Physics 74 (4):494-522;1998) For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (Up To 300 Ghz)
4. Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 Ghz)(1999/519/EC) (Official Journal L 197 of 30 July 1999)
5. RSS-102 Issue 6, Radio Frequency Exposure Compliance of Radiocommunications Apparatus (All Frequency Bands)
6. 47 CFR § 1.1310 – Radio Frequency radiation exposure limits
7. 47.CFR § 2.1091 – Radio Frequency radiation exposure evaluation: mobile devices
8. KDB 680106 D01 Wireless Power Transfer v04
9. P001E003-65-FCC PART 15 SUBPART C TEST REPORT for 125 kHz RFID Radio-Release.pdf Test Report (Issued by Applied Test Lab Inc., Unit 4174-3961 52nd Ave NE, Calgary Alberta, Canada, Apr 2024)

## 1.3 Performance Requirement

The EUT is marketed as **RFID mobile** equipment and must comply with the **47.CFR § 2.1091** RF Exposure limits or requirements.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increase RF emission levels should be checked and verified to ensure continuous compliance has been maintained (i.e., printed circuit board layout changes, Antenna changes, RF circuit changes. changes to filter performance, power supply changes, I/O cable and interface changes, critical component changes etc.)

## 1.4 Statement of Compliance

The **Phidgets Inc. Phidget 125 kHz RFID Reader/Writer 1024_1** contains one RFID system to enable read and write functionality. The typical installed configuration has been evaluated and found to be compliant with the essential requirement of human exposure to electromagnetic fields (EMF) according to **47.CFR § 2.1091 and** . **47.CFR § 1.1310**

During normal operation, the radiating element will be located at least 20 centimeters or more between the end user and the antenna.

The maximum radiated H-Field levels and unity antenna gains were used in the MPE calculations to present a worst-case assessment.

### 1.5 Test/Evaluation Results Summary

| Sec. | Test/Evaluation Type | Basic Standard | EN Part Clause | Result |
|---|---|---|---|---|
| 2.4 | RF Exposure | **47.CFR § 1.1310** | - | PASS |

### 1.6 Test/Evaluation Results Summary

For devices that operate at larger distances from persons, where there are minimal RF coupling interactions between a device and the user or nearby persons, the more complex SAR evaluation can be avoided by evaluating RF exposure compliance using MPE (Maximum Permissible Exposure) limits. When these limits are used, a minimum separation distance of ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons. The limits are presented in table below.

According to 680106 D01 Wireless Power Transfer v04, the MPE limits between 100 kHz to 300 kHz are to be considered the same as those at 300 kHz.

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm 2) | Averaging 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 |
| 300-1,500 | | | f/300 | ≤6 |
| 1,500-100,000 | | | 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 |
| 300-1,500 | | | f/1500 | ≤30 |
| 1,500-100,000 | | | 1.0 | ≤30 |

f = frequency in MHz

- = Plane-wave equivalent power density

**Occupational/controlled exposure** 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 a person 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 exposure** limits apply in situations in which the general public may be exposed, or in which persons who 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.

Power Density is calculated by equation:

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot R^2}$$

Where,
S = Power Density
P = Power Input to Antenna
G = Gain of Antenna
R = Distance from transmitting Antenna

**1. Portable use**
Portable use applies to head, body, and limbs worm equipment. Example: cell phone, pager, headset, disable alarms, laptops, communicating usb stick (3G, wifi, Bluetooth…)

**2. Mobile use**
Mobile use applies automotive equipment and is normally used in such a way that the minimum separation distance between the transmitter radiating structures and the body of the user or nearby persons is 20 centimeters. Example: automotive alarm system.

**3. Fixed use**
A fixed use device applies to table set top equipment, or ground or wall mounted devices. This would apply to devices not normally carried or moved during normal operation.

**Occupational / Controlled Exposure**

In general, occupational / controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, and have been made fully aware of the potential for exposure. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure, and instructions on methods to minimize exposure risks.

Reference levels (e.g., maximum permissible exposure values, investigation levels) for public exposure to electric, magnetic and electromagnetic fields are derived from the basic restrictions using realistic worst-case assumptions about exposure. If the reference levels are met, then the basic restrictions will also be met; if the reference levels are exceeded, that does not necessarily mean that the basic restrictions are exceeded. In some situations, it may be possible to show compliance with the basic restrictions directly. It may also be possible to derive compliance criteria that allow a simple measurement or calculation to demonstrate compliance with the basic restriction. Often these compliance criteria can be derived using realistic assumptions about conditions under which exposures from a device may occur, rather the the conservative assumptions that are the basis for

the reference levels.

(The limit is basic restriction)

If the technology in the equipment is not capable of producing at the normal user postion, an E-field, H-Field or contact current at levels higher tha the reference levels, e.g. there are no conductive touchable parts or the conductive touchable parts are permanently connected to ground, then the equipment is deemed to comply with the requirements in this standard in respect of that E-field, H-field or contact current without further assessment.

## 1.7 Assessment method

- ☒ Far field calculation
- ☐ Near field calculation
- ☐ Simulation with/without a phantom
- ☐ Numerical modeling
- ☐ Body/limb current
- ☐ SAR
- ☐ E & H measurement
- ☐ Source modeling
- ☐ Direct measurement of physical properties:Contact current

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

## 1.8 Test Facility Information

| | | | | | |
|---|---|---|---|---|---|
| **Name** | Applied Test Lab Inc. | | | | |
| **Address** | Unit 4174-3961 52nd Avenue NE, Calgary, Alberta, T3J 0J8, Canada | | | | |
| **Telephone** | 403 590 8701 | **Fax** | | 403 590 8570 | |
| **Email** | emctesting@appliedtestlab.com | **Website** | | www.appliedtestlab.com | |
| **FCC Registration** | 209928 | Designation Number | **CA0004** | **IC Recognition** | 10988A |

## 1.9 Client Information

| | | | |
|---|---|---|---|
| **Name** | **Phidgets Inc.** | | |
| **Address** | **Unit 1, 6115 - 4 Street S.E., Calgary, Alberta, Canada** | | |
| **Telephone** | 1-403-282-7332 | **Website** | |
| **Contact Name** | Chester Fitchett | **Contact Email** | fitchett@phidgets.com |

## 2.0 Test Sample Information

The **Phidget 125 kHz RFID Reader/Writer 1024_1** was only operated and exercised in the mode(s) and configuration(s) described in this report. All inputs and outputs to and from support equipment associated with the **Phidget 125 kHz RFID Reader/Writer 1024_1** were provided or simulated under the direction and responsibility of **Phidgets Inc.**. A description of these signals and their provision is included in Appendix A.

### 2.1 Product Classes (Per EN 300 330, Clause B.2)

| Product Class | Transmitter Technical Characteristics | Applicable |
|---|---|---|
| 1 | Inductive loop coil Tx, type tested with an antenna as either an integral antenna (antenna type 1); or a dedicated supplied antenna supplied with the equipment (antenna type 2) Where a manufacturer provides a range of standard antennas, the equipment will be tested as Product Class 1 equipment, with the antenna(s) attached. The measurements shall be repeated for each antenna. | X |
| 2 | Inductive loop coil Tx, type tested with Two representative antennas supplied with the equipment The two antennas shall meet the manufacturer's design rules published in the equipment manual and shall have maximum and minimum loop areas respectively. Both antennas shall have the maximum magnetic dipole moment as declared by the manufacturer. | |
| 3 | This Class of equipment is intended for use with customized large size loop antenna only. The loop coil Tx is type tested without an antenna by using an artificial antenna. | |
| 4 | E-field Tx, type with each type of antenna to be used. | |

### 2.2 Equipment Under Test (EUT)

| | |
|---|---|
| **Product Description** | The Phidget RFID Reader/Writer is a device used to read or write to RFID tags. Using an embedded PCB antenna, the 1024_1 radiates an electromagnetic field in order to read or write tags. When a tag is brought into the read range of the 1024_1, the tag is momentarily powered and rebroadcasts its tag identification number. The tag identification is read by the 1024_1 and made available to the user. There are many different tags available and the 1024_1 can read and/or write to tags that are: EM4102, ISO11784, T5577<br><br>Typical applications include:<br>Security - Access Control<br>Payroll - Time Clock<br>Inventory – Livestock, merchandise or goods |
| **Manufacturer** | **Phidgets Inc.** |
| **Trade Name** | NA |
| **Model Number** | **Phidget 125 kHz RFID Reader/Writer 1024_1** |

| | |
|---|---|
| **Serial Number** | **374295** |
| **Model discrepancy/Variations** | None |
| **FCC ID** | SUT1024-1 |
| **IC Registration** | |
| **Power Supply and Requirements** | USB power and 5V DC external, 500mA max |
| **Hardware Version** | |
| **Firmware Version** | 301 |
| **Software Version** | 1.17 20231031 |
| **Antenna Type** | PCB Installed Inductive Coil |
| **Antenna Connection Type** | Soldered, Integral |
| **Operating Frequency** | 125kHz |
| **Number of Channels** | 1 |
| **Modulation Type** | |
| **Modulation Technology** | |
| **Product Class** | 1 |
| **Other Information** | N/A |
| **Product Manufacturing Status** | ☒Production Unit ☐Pre-Production Unit |

Note: For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

## 2.3 RF Exposure Calculation Method:

1. Calculate EIRP/ERP in dBm using measured field intensity and distance
2. Convert EIRP/ERP to Watts using Antenna Gain. If Antenna gain is unknown use Unity Gain.
3. Calculate the field strength (V/m or A/m) at the distance where human body is most likely present, say 20cm.
4. Apply the limit
5. Assess the Result.

## 2.4 Assessment Result-RFID Reader/Writer

Refer to test report[9] for Panel RFID for Measured E-Field.

| Frequency (MHz) | Measured E-Field @ 3m [9] (dBuV/m) | Distance Factor 3m to 0.2m (dB) | E-Field @ 20cm (dBuV/m) | E-Field @ 20cm (V/m) | E-Field Limit (V/m) | Result |
|---|---|---|---|---|---|---|
| 0.125 | 78.0 | 23.52 | 101.52 | 0.119124 | 614 | PASS |

## 3.0 Appendix A – Test Sample Description

EUT Description

The test sample is a hand-built production sample, which was assembled, soldered & tested by Phidgets Inc. Called a “Gold Board”, the test sample is intended to mimic the final product as closely as possible. This is to ensure that the final appearance and packaging is correct and within acceptable tolerances. It is also loaded with the final version of firmware to ensure proper operation and to verify full functionality. Once tested, the designs are provided to Contract Manufacturer for mass production.

## 5.0 Appendix B – List of Abbreviations and Acronyms

**Industrial, scientific and medical (ISM) applications (of radio frequency energy)**
operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications

**ISM equipment and appliances**
equipment or appliances designed to generate and/or use locally radio-frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications and information technology and other applications covered by other CISPR publications

**Electromagnetic radiation**

1. phenomenon by which energy in the form of electromagnetic waves emanates from a source into space
2. energy transferred through space in the form of electromagnetic waves

**Boundary of the equipment under test**
imaginary straight line periphery describing a simple geometric configuration encompassing the equipment under test. All interconnecting cables are included within this boundary

**Electro-discharge machining (EDM) equipment**
all the necessary units for the spark erosion process including the machine tool, the generator, control circuits, the working fluid container and integral devices

**Spark erosion**
removal of material in a dielectric working fluid by electro-discharges, which are separated in time and randomly distributed in space, between two electrically conductive electrodes (the tool electrode and the work piece electrode), and where the energy in the discharge is controlled

**Arc welding equipment**
equipment for applying current and voltage and having the required characteristics suitable for arc welding and allied processes

**Equipment for resistance welding and allied processes**
all equipment associated with carrying out the processes of resistance welding or allied processes consisting of e.g. power source, electrodes, tooling and associated control equipment, which may be a separate unit or part of a complex machine

**Low voltage LV**
a set of voltage levels used for the distribution of electricity and whose upper limit is generally accepted to be 1 000 V a.c.

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