



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Phase IV Engineering

Model: 41-100382-00

Description: MACS LID Reader

Serial Number: N/A

FCC ID: N4T-4110038200

To

FCC Part 15.209

Date of Issue: January 31, 2017

On the behalf of the applicant:

**Phase IV Engineering
2820 Wilderness Place, Unit C
Boulder, Colorado 80301**

Attention of:

**Joe Letkomiller, Hardware Engineer
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**Alex Macon
Project Test Engineer**

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All results contained herein relate only to the sample tested



Test Report Revision History

| Revision | Date | Revised By | Reason for Revision |
|----------|-------------------|-------------|---------------------------------------------------------------------------------|
| 1.0 | December 29, 2016 | Alex Macon | Original Document |
| 2.0 | January 27, 2017 | Alex Macon | Added detector note to page 8 Added language to the test procedure on page 8 |
| 3.0 | January 30, 2017 | Amanda Reed | Updated FCC ID |
| 4.0 | January 31, 2017 | Alex Macon | Added language to test procedure and notes on page 8 |



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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted in the table below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The applicant has been cautioned as to the following:

15.21 Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator the responsible part may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.



Standard Test Conditions Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.10-2013 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F), unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Measurement results, unless otherwise noted, are worst-case measurements.

| Environmental Conditions | | |
|--------------------------|-----------------|--------------------|
| Temperature (°C) | Humidity (%) | Pressure (mbar) |
| 22.1 | 32.8 | 969.8 |

EUT Description

Model: 41-100382-00

Description: MACS LID Reader

Firmware: N/A

Software: N/A

Serial Number:

Additional Information: N/A

EUT Operation during Tests

The EUT was placed in a test mode by the manufacturer. The test mode forces the EUT into a transmission cycle. The cycle consists of High power and Low power transmission at 134.2 kHz

Accessories: None

Cables: None

Modifications: None



Test Results Summary

| Specification | Test Name | Pass, Fail, N/A | Comments |
|---------------|-------------------------------|-----------------|-----------------------------|
| 15.209 | Radiated Emissions | Pass | |
| 15.207 | Conducted Powerline Emissions | N/A | The EUT is battery powered. |

15.203: Antenna Requirement:

- ☒ The antenna is permanently attached to the EUT
- ☐ The antenna uses a unique coupling
- ☐ The EUT must be professionally installed
- ☐ The antenna requirement does not apply

Radiated Emissions

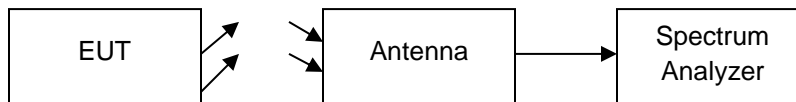
Engineer: Alex Macon

Test Date: 12/29/16

Test Procedure

The EUT was tested in a semi-anechoic chamber at a distance of 1 meter from the receiving antenna. A spectrum analyzer was used to verify that the UUT met the requirements for Radiated Emissions. The spectrum for each tuned frequency was examined beyond the 10th harmonic. Measurements were made with the measuring antenna in the horizontal and vertical axis. For each measurement antenna alignment, the EUT was rotated through 0° to 360° on a turntable. The worst case emissions are detailed below.

Test Setup



Radiated Emissions

| Emission Frequency (kHz) | Measured Value (dBuV/m) | Antenna Correction Factor (dB) | Distance Correction Factor (dB) | Corrected Value (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|-------------------------|--------------------------------|---------------------------------|--------------------------|----------------|-------------|
| 134.2 (Fundamental) | 113.14 | 16.4 | 99.08 | -2.34 | 25.05 | -27.39 |
| 268.4 | 74.04 | 16.3 | 99.08 | -41.34 | 19.03 | -60.37 |
| 402.6 | 75.3 | 16.3 | 99.08 | -40.08 | 15.51 | -55.59 |
| 536.8 | 64.91 | 16.3 | 59.08 | 5.83 | 33.01 | -27.18 |
| 671 | 64.87 | 16.3 | 59.08 | -10.51 | 31.07 | -41.58 |
| 805.2 | 53.22 | 16.3 | 59.08 | -22.16 | 29.49 | -51.65 |
| 939.4 | 59.89 | 16.3 | 59.08 | -15.49 | 28.15 | -43.64 |
| 1073.6 | 55.38 | 16.3 | 59.08 | -20 | 26.99 | -46.99 |
| 1207.8 | 55.42 | 16.3 | 59.08 | -19.96 | 25.96 | -45.92 |
| 1342 | 43.96 | 16.3 | 59.08 | -31.42 | 25.05 | -56.47 |

All measurements were taken with a peak detector.

Due to physical restrictions of the antenna mount, the testing height of the EUT and antenna was set to 100cm.

It was confirmed that an 80cm table height did not alter the measurement.

The distance correction of 40dB/decade was used as detailed in 15.31

Note: Cable correction factors are not included in this measurement as the low loss of the high quality TWINAX cable at low frequencies is practically non-existent.



Test Equipment Utilized

| Description | Manufacturer | Model # | CT Asset # | Last Cal Date | Cal Due Date |
|------------------------------------|--------------|-------------------------------|------------|---------------|--------------|
| Humidity / Temp Meter | Newport | IBTHX-W-5 | i00282 | 5/26/16 | 5/26/17 |
| Active Loop Antenna 1 kHz - 30 MHz | EMCO | 6507 | i00326 | 9/1/15 | 9/1/17 |
| Bi-Log Antenna | Schaffner | CBL 6111D | i00349 | 8/3/16 | 8/3/18 |
| EMI Analyzer | Agilent | E7405A | i00379 | 2/11/16 | 2/11/17 |
| 3 Meter Semi-Anechoic Chamber | Panashield | 3 Meter Semi-Anechoic Chamber | i00428 | 8/15/16 | 8/15/19 |

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT