



# Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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## Test Report

Prepared for: Adasa. Inc

Model: M6E-M

Description: Dual linear polarization directional UHF RFID reader

Serial Number: 1

FCC ID: QV5MERCURY6E-M

IC: 5407A-MERCURY6EM

To

FCC Part 15.247 FHSS

RSS-247 Issue 2

RSS GEN Issue 5

Date of Issue: February 6, 2019

On the behalf of the applicant:

Adasa Inc.  
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Eugene, OR 97405

Attention of:

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Project No: p1860018

Poona Saber  
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      | June 20, 2018    | Poona Saber | Original Document                                                                                                                                                                                          |
| 2.0      | January 17, 2019 | Poona Saber | -changed the model of the product<br>-added measurement uncertainty<br>-added RSS rules and clauses<br>-changed measurement of peak reading on page 9 with compensation for higher RBW<br>-Updated Annex A |
|          |                  |             |                                                                                                                                                                                                            |
|          |                  |             |                                                                                                                                                                                                            |

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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 party 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 and Engineering Practices

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual Part: 15.247 Operation within bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

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

In accordance with ANSI C63.4:2014, ANSI C63.10:2013, FCC DA 00-705, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10 to 40C (50 to 104F) 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.

| Environmental Conditions |                 |                    |
|--------------------------|-----------------|--------------------|
| Temperature<br>(°C)      | Humidity<br>(%) | Pressure<br>(mbar) |
| 19-26                    | 28-41           | 941-986            |

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

### EUT Description

**Model:** M6E-M

**Description:** Dual linear polarization directional UHF RFID reader

**Firmware:** N/A

**Software:** N/A

**Serial Number:** 1

### Additional Information:

Device is a mobile RFID tag reader micro air vehicle using an RFID module with FCC ID of QV5MERCURY6E-M and incorporating Adasa G9 antenna to it for class II permissive change on the same ID. The gain of the antenna is 7.15 at its maximum. The hopping is stopped and device is put on low, Mid and High frequencies for purpose of peak Output power, radiated spurious emissions. Bandedge emissions are measured both with hopping on and hopping stopped.

### EUT Operation during Tests

EUT is powered through USB with the laptop which controls its testing configuration as well. Both the unit and the laptop are located in the chamber for testing and emissions are measured once with laptop in the chamber only to verify no emissions beyond the limit are emitting from the laptop.

### 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



**Accessories:**

| Qty | Description                              | Manufacturer | Model | S/N |
|-----|------------------------------------------|--------------|-------|-----|
| 1   | Laptop to control the channels and power | N/A          | N/A   | N/A |

**Cables:**

| Qty | Description                             | Length<br>(M) | Shielding<br>Y/N | Shielded Hood<br>Y/N | Ferrite<br>Y/N |
|-----|-----------------------------------------|---------------|------------------|----------------------|----------------|
| 1   | USB cable from the unit to the computer | <1            | N/A              | N/A                  | N/A            |

**Modifications:** None



## Test Results Summary

| Specification                                        | Test Name                         | Pass, Fail, N/A | Comments                       |
|------------------------------------------------------|-----------------------------------|-----------------|--------------------------------|
| 15.247(b)<br>RSS 247 5.4                             | Peak Output Power                 | Pass            |                                |
| 15.247(d)<br>RSS 247 5.5, RSS GEN                    | Conducted Spurious Emissions      | N/A             | C2PC only – testing not needed |
| 15.247(d), 15.209(a), 15.205<br>RSS 246 5.5, RSS GEN | Radiated Spurious Emissions       | Pass            |                                |
| 15.247(d), 15.209(a), 15.205<br>RSS 246 5.5, RSS GEN | Emissions At Band Edges           | Pass            |                                |
| 15.247(a)<br>RSS 246 5.1                             | Occupied Bandwidth                | N/A             | C2PC only – testing not needed |
| 15.247(a)<br>RSS 246 5.1                             | Dwell Time                        | N/A             | C2PC only – testing not needed |
| 15.247(a)<br>RSS 246 5.1                             | Number of Hopping Channels        | N/A             | C2PC only – testing not needed |
| 15.207                                               | A/C Powerline Conducted Emissions | N/A             | C2PC only – testing not needed |
| RSS-GEN §7                                           | Receiver Spurious Emissions       | N/A             | C2PC only – testing not needed |



## Peak Output Power

**Engineer:** Poona Saber

**Test Date:** 6/20/2018

### Test Procedure

The EUT was connected directly to the input of a power meter. The peak readings were taken and the result was then compared to the limit.

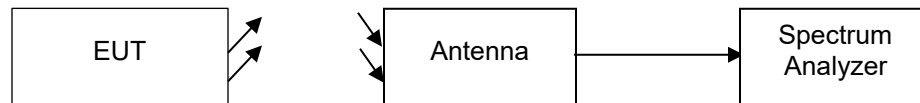
Per ANSI C63.10 part 7.8.5, RBW bigger than 20 dB bandwidth shall be used for power measurement. Measurement below is compensated for RBW difference per formula below :

Compensated power = measured power + 10 log ( RBWc/RBWm)

RBWc= RBW compensated

RBWm= RBW used for measurement

### Test Setup

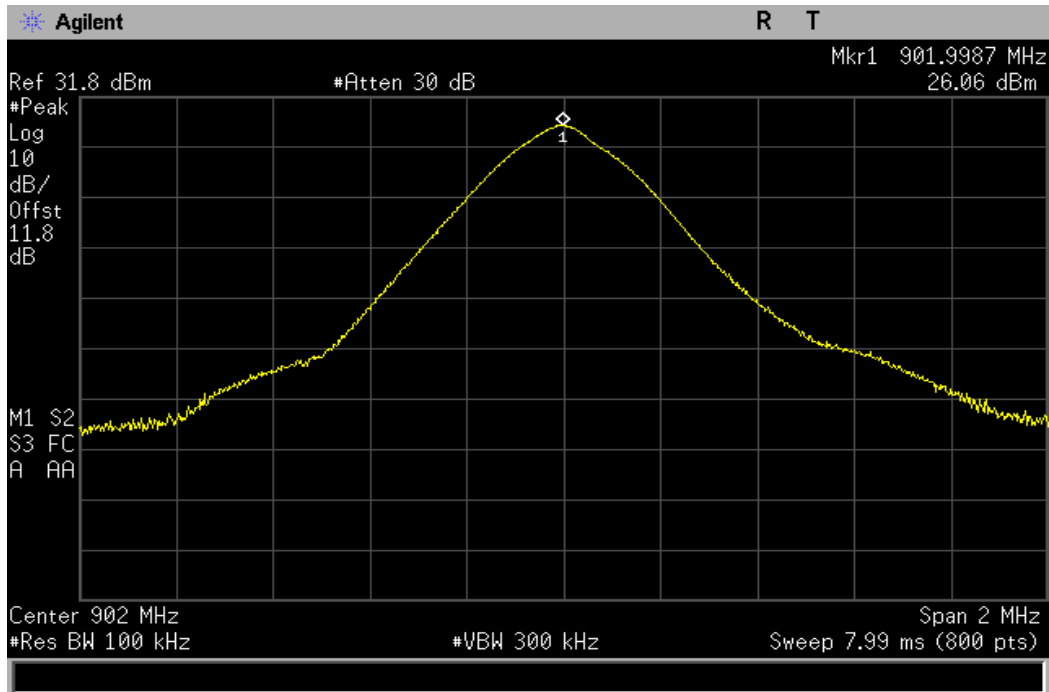


### Transmitter Peak Output Power

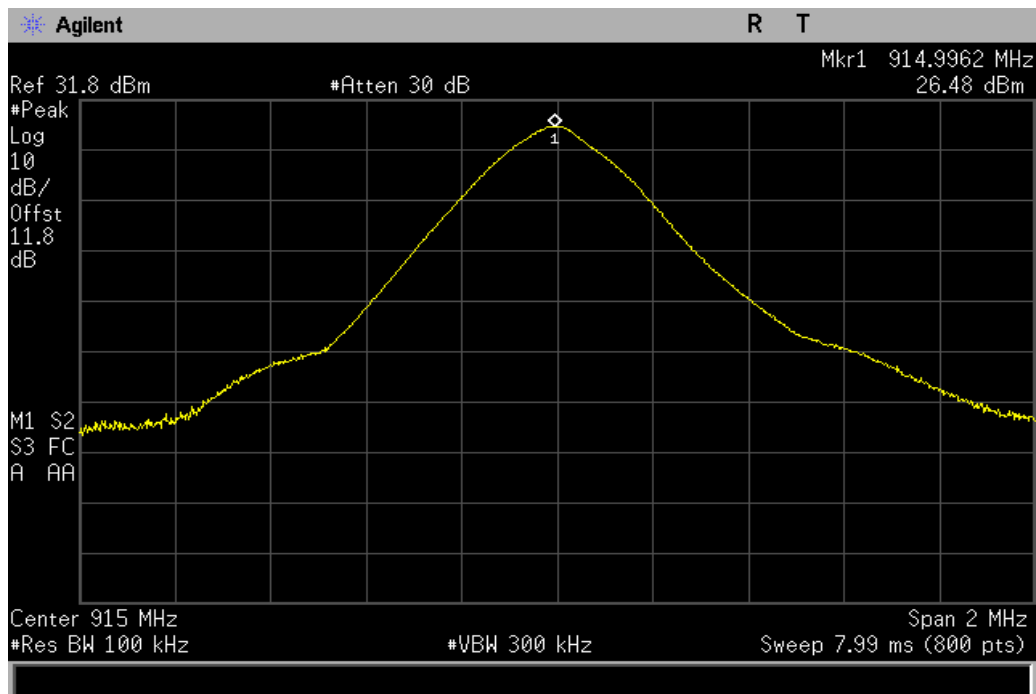
| Tuned Frequency (MHz) | Recorded Measurement EIRP (dBm) | RBW COMPENSATION    | Power EIRP (dBm) | Specification Limit EIRP (dBm) | Result |
|-----------------------|---------------------------------|---------------------|------------------|--------------------------------|--------|
| 902.75                | 26.06                           | 10 LOG ( 500/100)=7 | 33.06            | 36                             | Pass   |
| 915.25                | 26.48                           | 10 LOG ( 500/100)=7 | 33.48            | 36                             | Pass   |
| 927.25                | 26.38                           | 10 LOG ( 500/100)=7 | 33.38            | 36                             | Pass   |



### Low Channel peak EIRP radiated

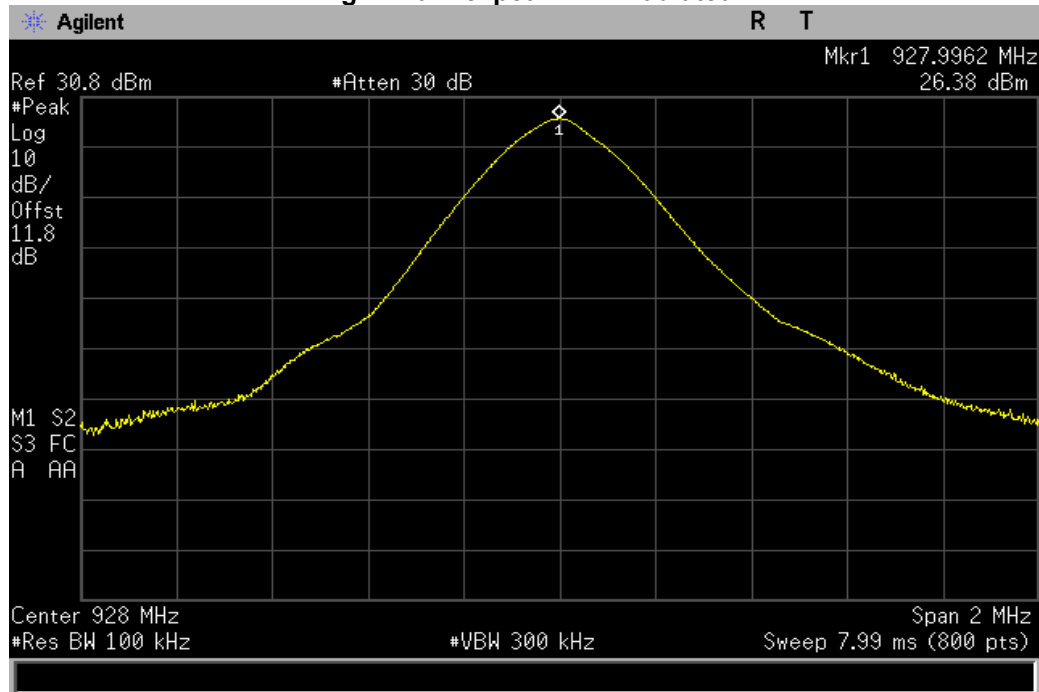


### Mid Channel peak EIRP radiated





### High Channel peak EIRP radiated





## Radiated Spurious Emissions

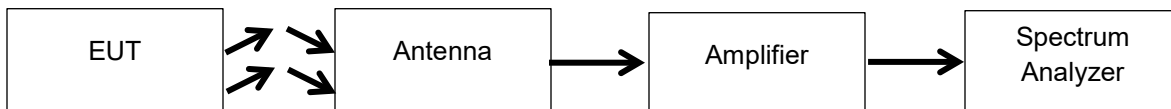
**Engineer:** Poona Saber

**Test Date:** 6/20/2018

### Test Procedure

The EUT was tested in a semi-anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions. The antenna and cable correction factors were summed with the amplifier gain and entered into the spectrum analyzer as an offset to ensure accurate readings. The spectrum for each tuned frequency was examined to the 10<sup>th</sup> harmonic.

### Test Setup



| Detector Settings | RBW   | VBW   |
|-------------------|-------|-------|
| Peak              | 1 MHz | 3 MHz |
| Average           | 1 MHz | 3 MHz |

Radiated spurious have been checked both for part 15.247 in every 100 KHz Bandwidth outside of the frequency band and for restricted bands of 15.205 to comply with 15.209 limits.

**Please refer to Annex A for test results**



## Emissions at Band Edges

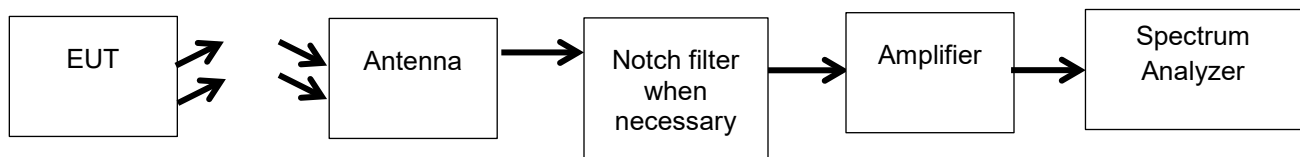
**Engineer:** Poona Saber

**Test Date:** 6/20/2018

### Test Procedure

The EUT was tested in a 3 meter semi-anechoic chamber. A spectrum analyzer was used to verify that the EUT met the requirements for band edge with both peak and average measurements. The cable and transducer correction factors were input into the analyzer as a reference level offset to ensure accurate readings.

### Test Setup



**Please refer to Annex B for test results**



## Measurement Uncertainty

Measurement Uncertainty ( $U_{lab}$ ) for Compliance Testing is listed in the table below.  
The reported expanded uncertainty  $U_{lab}$ (dB) has been estimated at a 95% confidence level ( $k=2$ )

| Measurement                   | $U_{lab}$                 |
|-------------------------------|---------------------------|
| Radio Frequency               | $\pm 1.0 \times 10^{-12}$ |
| RF Power, conducted           | $\pm 0.43$ dB             |
| RF Power Density, conducted   | $\pm .98$ dB              |
| Spurious Emissions, Conducted | $\pm 2.49$ dB             |
| All Emissions, radiated       | $\pm 5.7$ dB              |
| Temperature                   | $\pm 1.0$ deg C           |
| Humidity                      | $\pm 4.3$ %               |
| Dc voltage                    | $\pm .12$ %               |
| Low Frequency voltages        | $\pm 2.3$ %               |

The reported expanded uncertainty  $\pm U_{lab}$ (dB) has been estimated at a 95% confidence level ( $k=2$ )

$U_{lab}$  is less than or equal to  $U_{CISPR}$  therefore

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit



## Test Equipment Utilized

| Description                   | Manufacturer           | Model #                       | CT Asset # | Last Cal Date | Cal Due Date |
|-------------------------------|------------------------|-------------------------------|------------|---------------|--------------|
| Bi-Log Antenna                | Schaffner              | CBL 6111D                     | i00349     | 8/3/16        | 8/3/18       |
| Spectrum Analyzer             | Agilent                | E4407B                        | i00331     | 11/21/17      | 11/21/18     |
| 3 Meter Semi-Anechoic Chamber | Panashield             | 3 Meter Semi-Anechoic Chamber | i00428     | 8/15/16       | 8/15/19      |
| 1-18GHz Horn Antenna          | Antenna Research Assoc | DRG-118/A                     | i00271     | 6/16/16       | 6/16/18      |
| 1-18 GHz pre amplifier        | Miteq                  | AFS44-00101-400-23-10P-44     | i00509     | NCR           |              |

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

END OF TEST REPORT