

Altitude Testing of DC Voltage Standards



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RAM V
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Problem Statement

- Customer operates DC voltage standard at various laboratories
- Laboratories have different elevations
- Altitude affects performance of voltage standards
- Customer needs voltage standard tested at various altitudes



Objective

- Observe effects of altitude on DC voltage standard
 - Characterization
 - Simulation
 - Data analysis



Testing Apparatus

- Fluke 734A DC Reference Standard
 - Consists of 4 Fluke 732B direct voltage standards



- ESPEC altitude chamber
 - Temperature range : -40 ° C to 100 ° C
 - Altitude range: Sea level to 100,000 ft
 - Able to maintain 20%-80% RH at or below 5,000 ft



Testing Apparatus (cont.)

- Hewlett Packard 3458A digital multimeter
- DataProof Low Thermal Scanner
- Laptop with DataProof VoltRef software



Characterization

- Performed prior to and after simulation
- Scanner measures readings between two points
- Test unit measured against reference unit
- Reference standard calibrated to Josephson standard

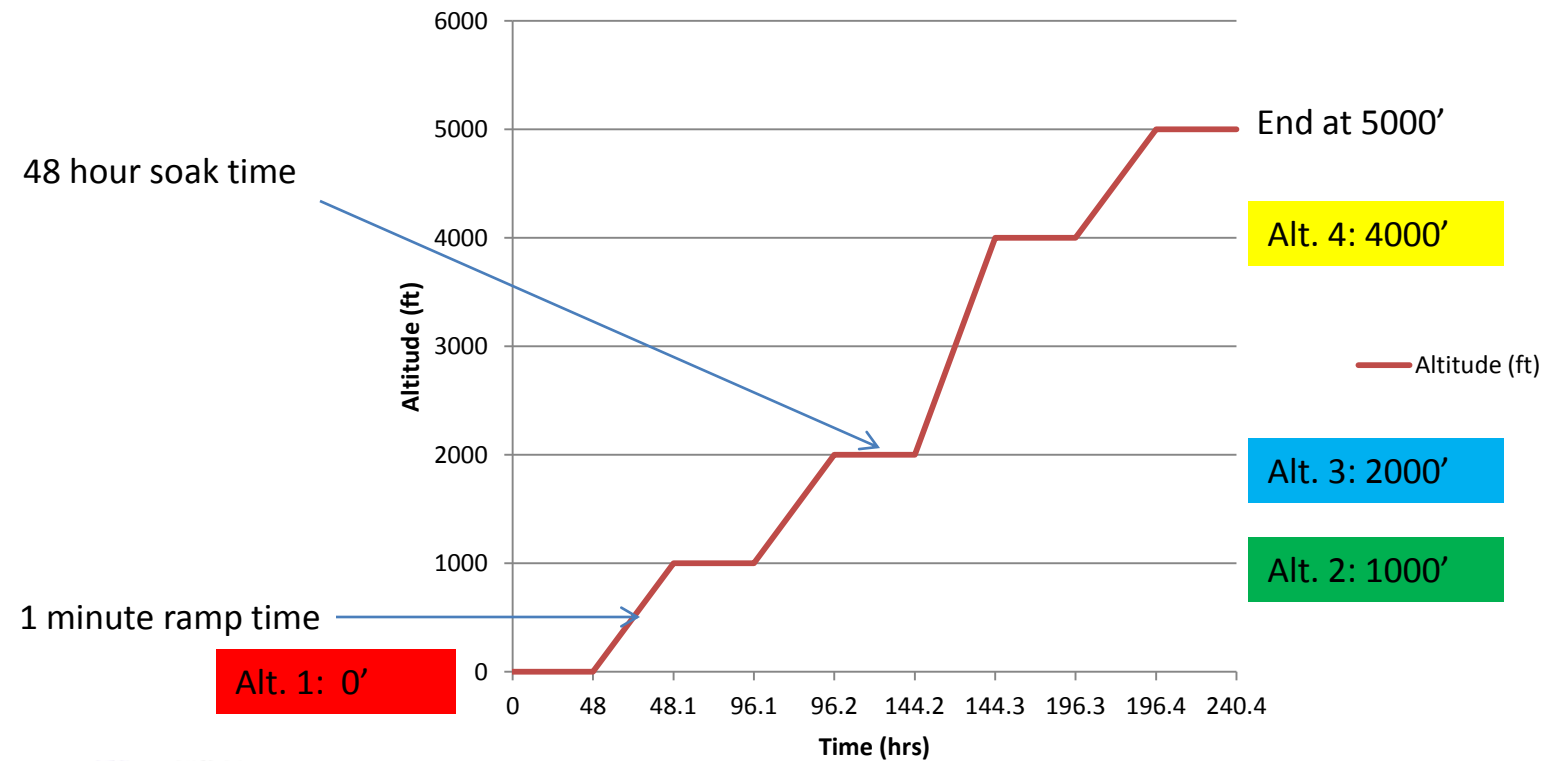


Altitude Simulation

- Elevations provided by customer
- Altitude profile created
 - Begin at sea level
 - End at 5,000 ft
- Four target altitudes
- Ramp time of 1 minute
- “Soak” time of 48 hours
 - Adequate time for stabilization
- Total test time of 240 hours

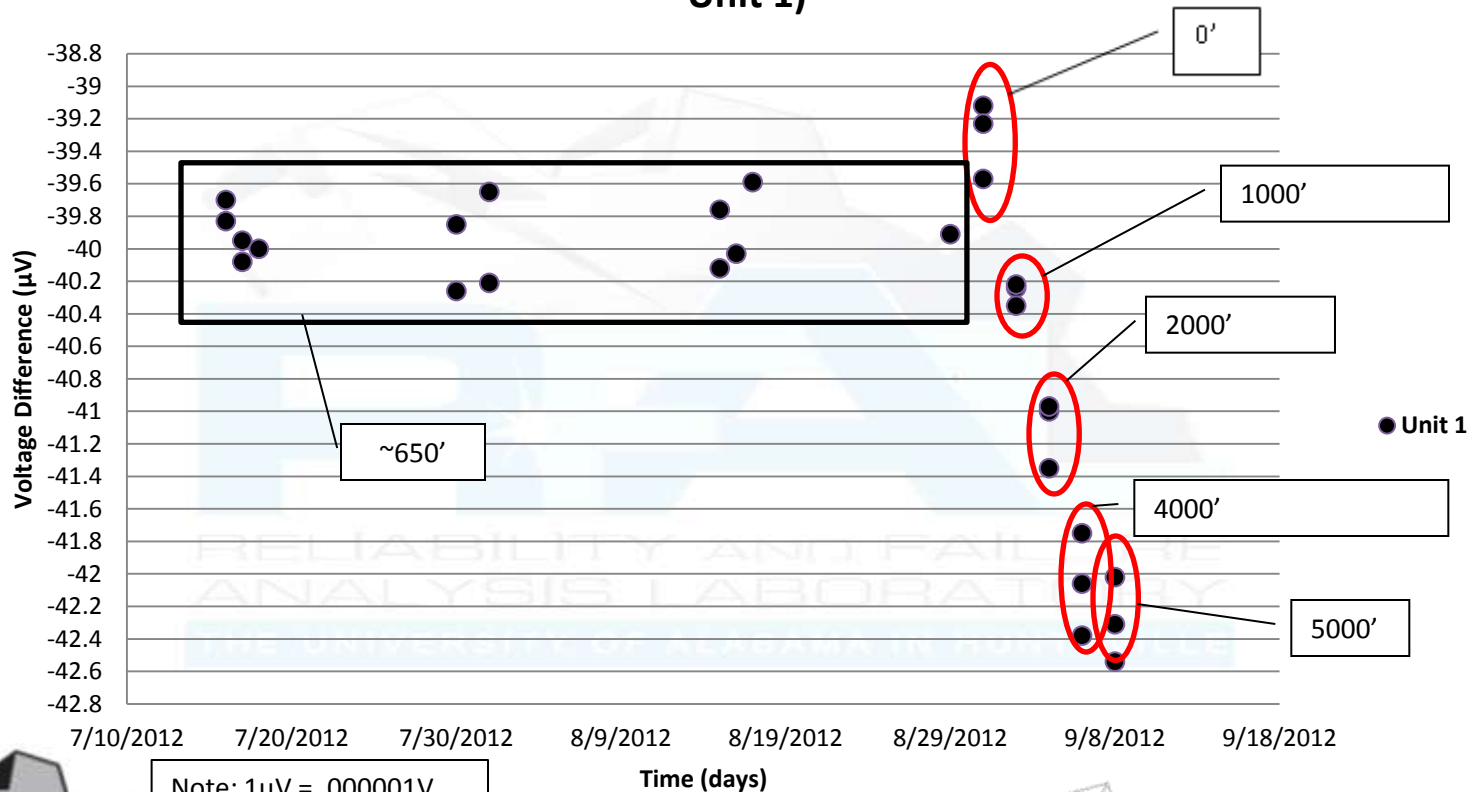


Altitude Test Profile



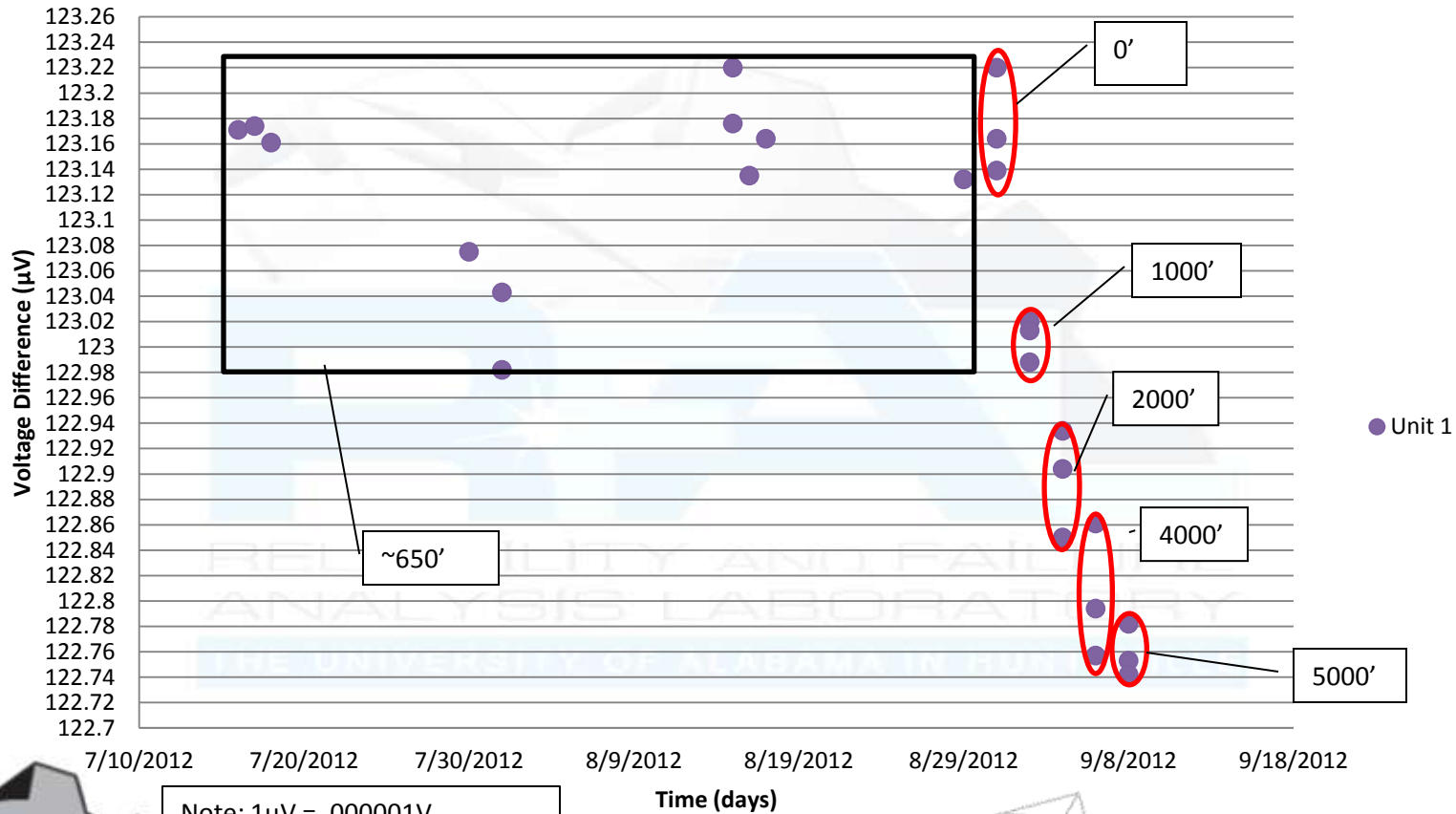
Analysis of Data

Avg. Voltage Difference vs. Time (10V taps Standard Unit vs. Test Unit 1)



Analysis of Data (cont.)

Avg. Voltage Difference vs Time (1V taps Standard Unit vs. Test Unit 1)



Conclusions

- Voltage readings were affected
- Altitude was main contributing factor



Questions/Comments?

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