

Solar Cell IV Measurement... to the Moon

Space Power Workshop April 23-25, 2024
Torrance, CA

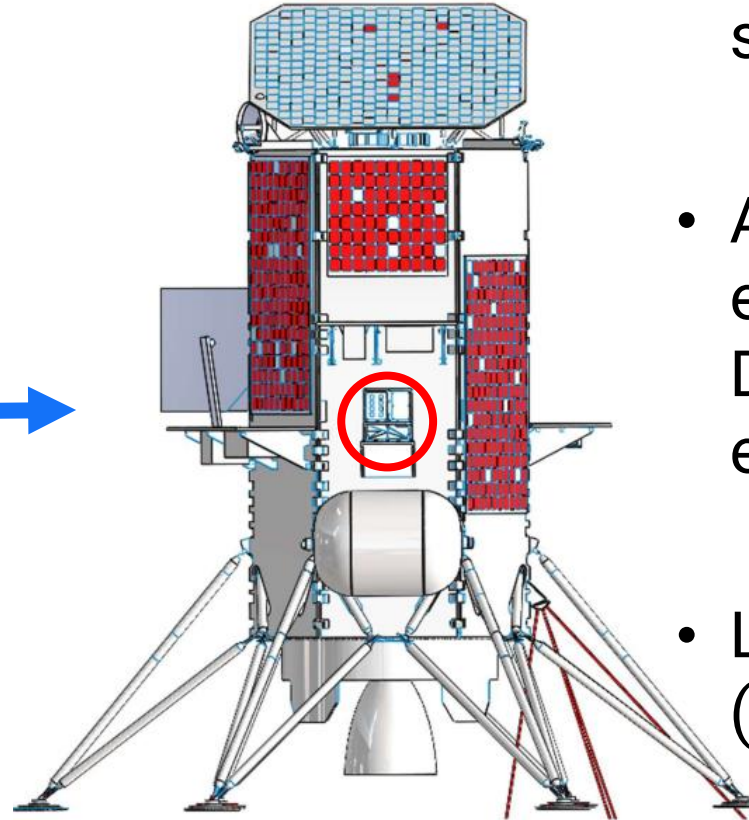
Scott Ireton, Casey Hare, Andrew Schwab - Angstrom Designs, Inc.
Eric Jordan, Charles Parrish - Aegis Aerospace, Inc.

Introduction



MISSE on ISS

Image courtesy of NASA

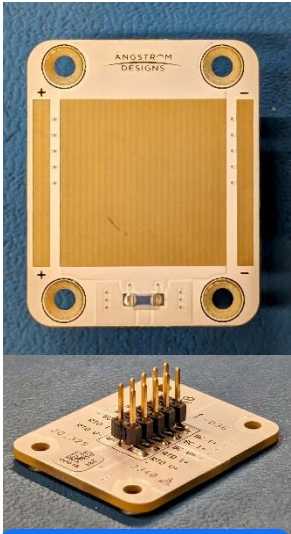


- Greater access to space solar cell testing
- Aegis Aerospace's MISSE experience and Angstrom Designs' cell testing experience
- Lunar Solar Cell Test Bed (SCTB)

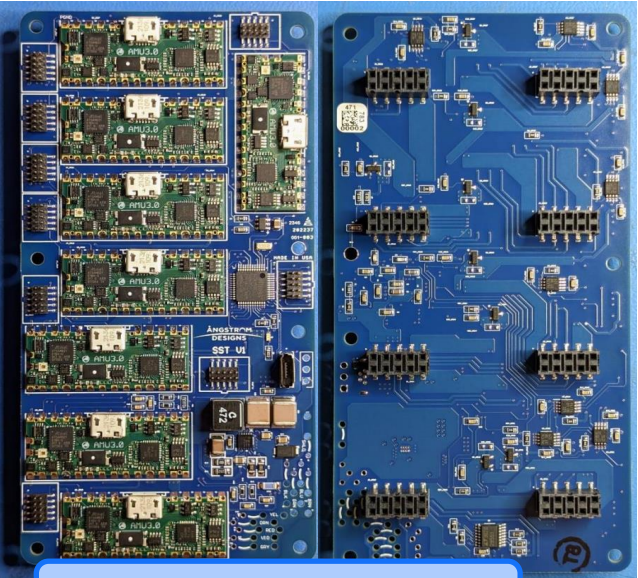
Measurement Hardware



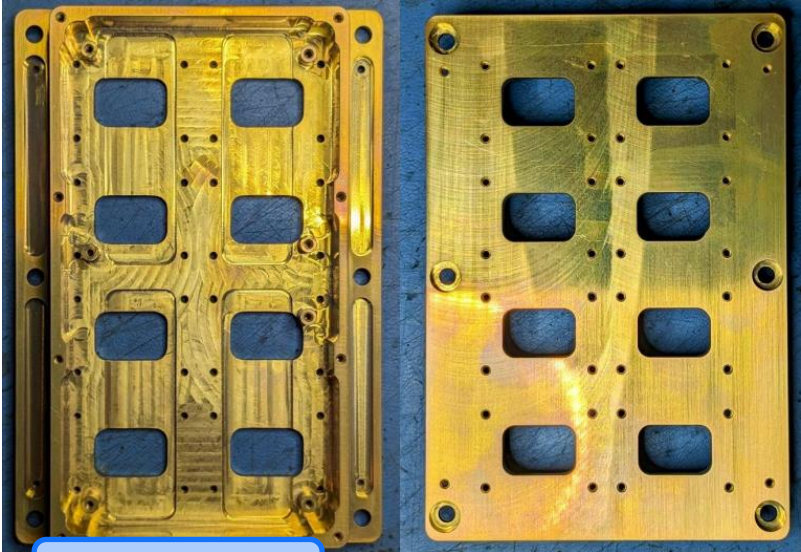
AMU V3



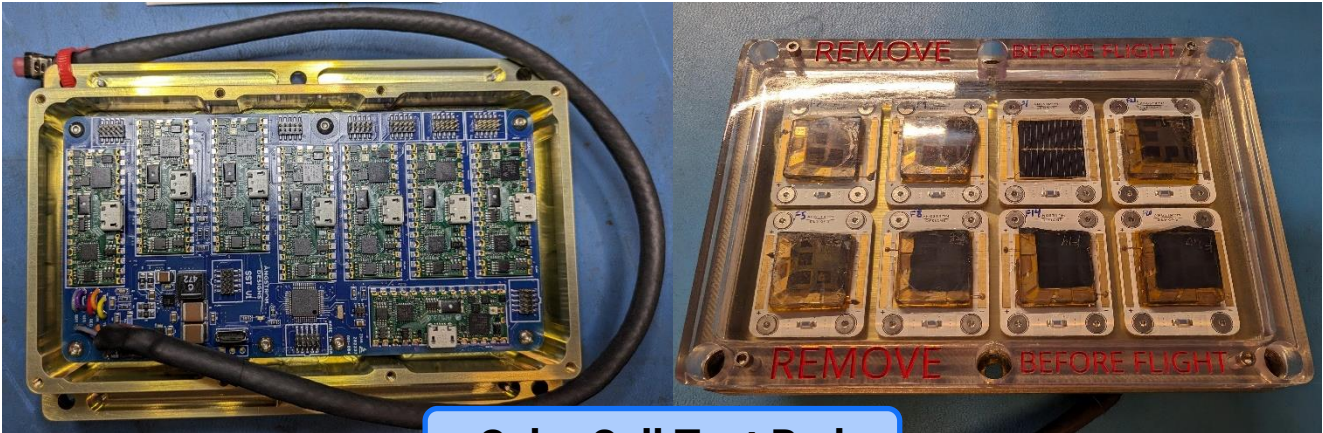
Cell Holders



AMU Coordinator PCB



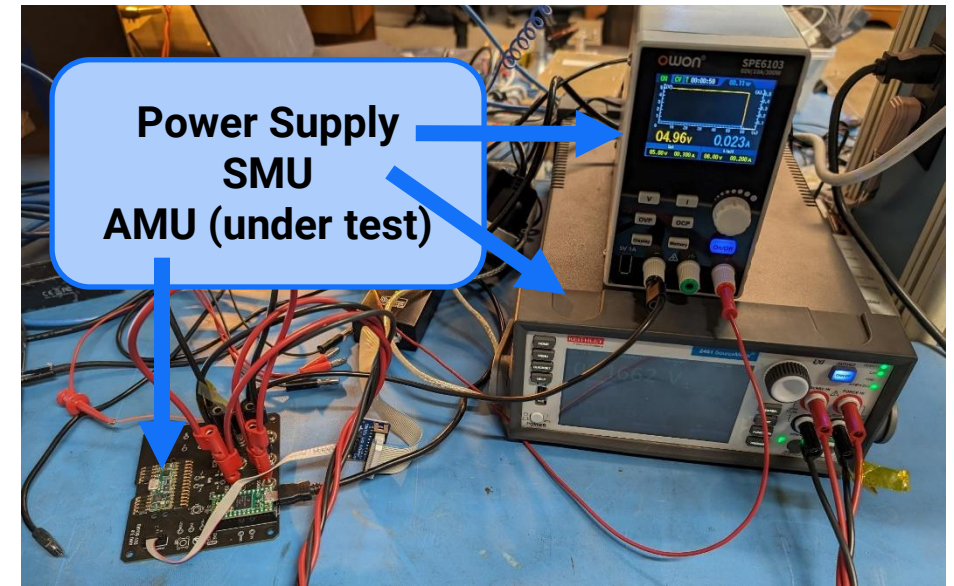
Housing



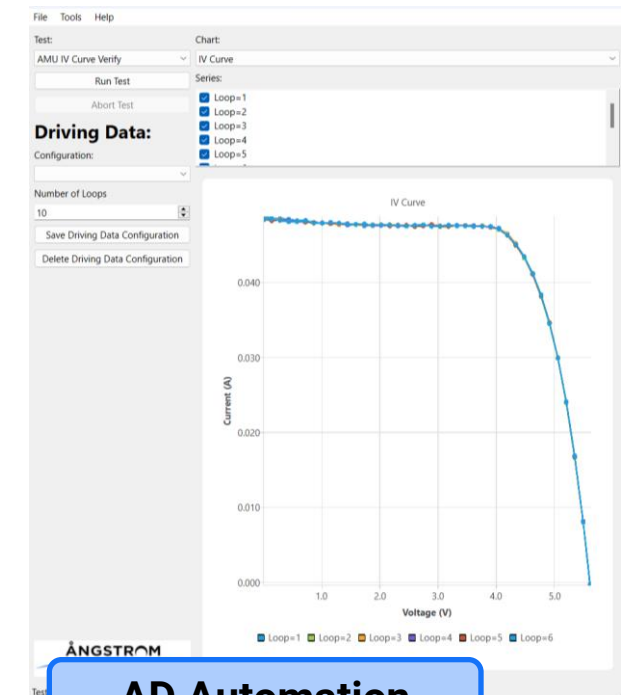
Solar Cell Test Bed

AMU Manufacturing

- Angstrom Designs is a licensed manufacturer of the AMU
- Custom automated test suite for verifying AMU performance
 - Base functionality (Power/USB/I2C)
 - Load functionality
 - Current measurement error
 - Voltage measurement error
 - Temperature measurement error



pLEDss Head & Cell

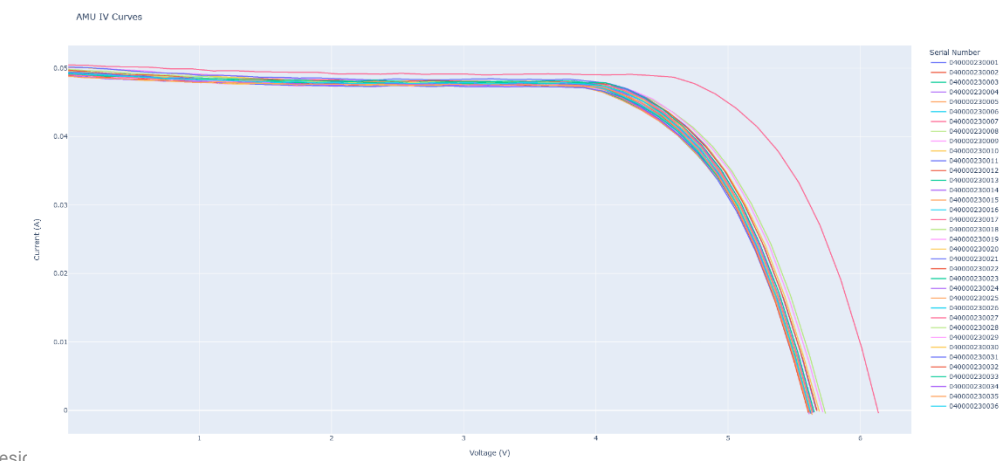
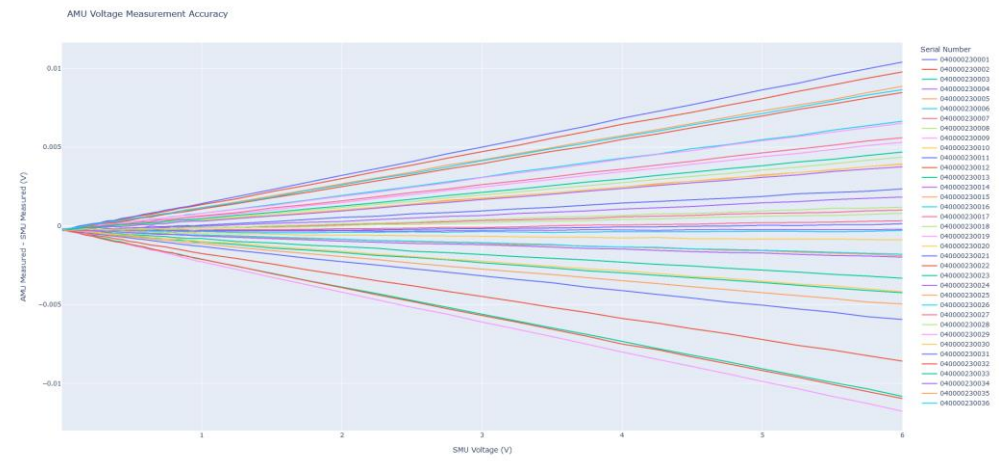
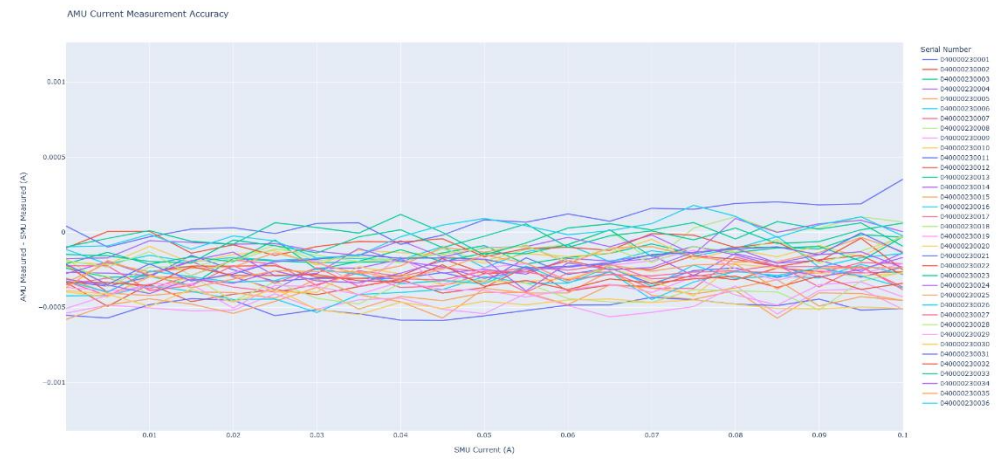


AD Automation

Measurement Error

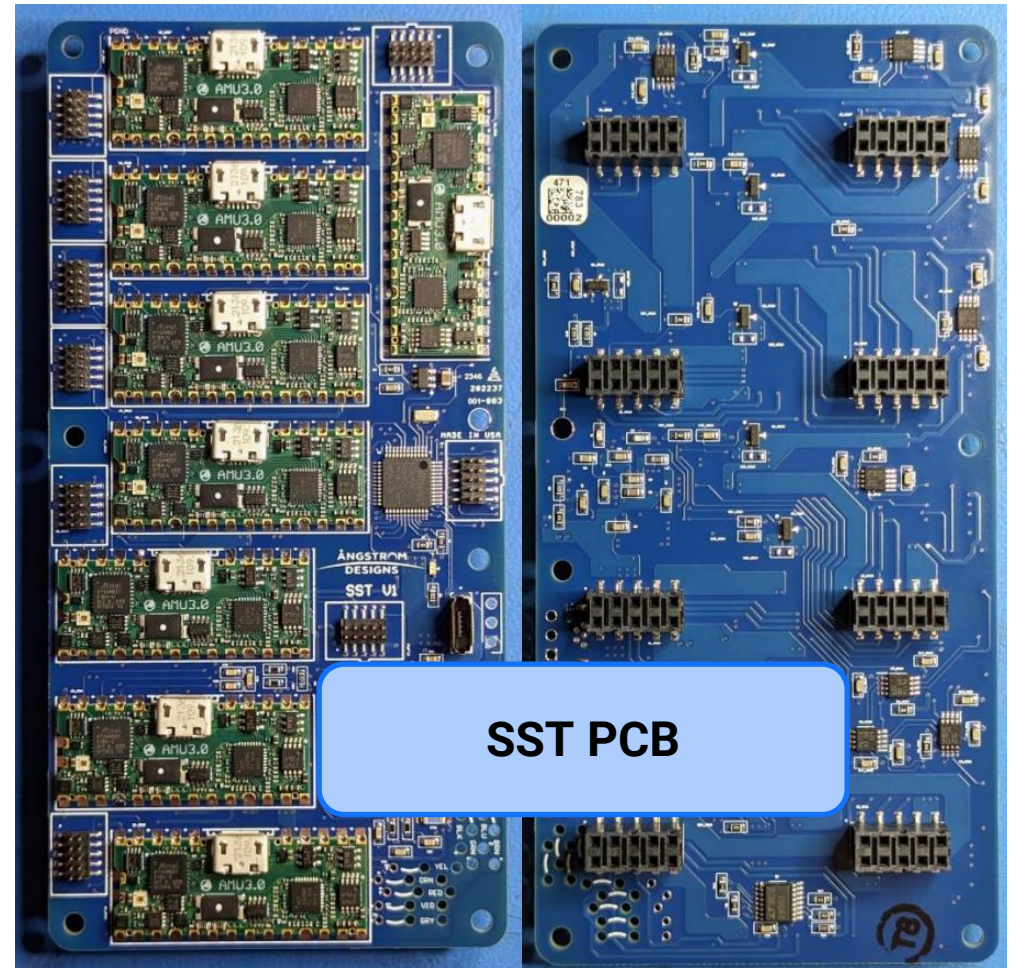
- Some systematic error (correctable) observed in the AMU “out of box” performance
- Future Angstrom Designs AMU calibrations will correct for this error

| Parameter | Worst Case Measurement |
|-----------|------------------------|
| Voltage | 0.2% |
| Current | 500 μ A |



Space Solar Tester (SST)

- SST talks to spacecraft over RS-422 or to a computer with USB
- Firmware coordinates synchronous AMU measurements on all 8 cells
- Simple command structure for changing sweep settings or triggering specific measurements





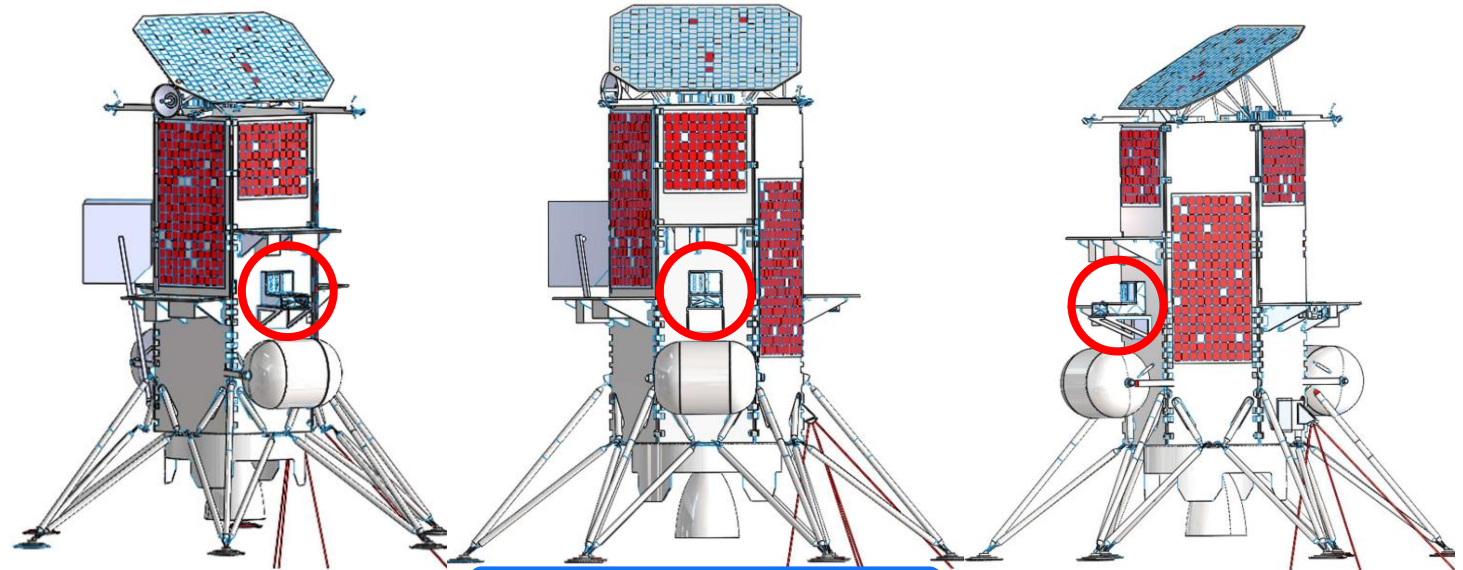
SCTB Under pLEDs

Final Integration

- Final SCTB shipped in only 3 months!
- Integrated into Aegis Aerospace's Space Science Technology & Evaluation Facility (SSTEF) lunar chassis
- Ready for integration onto IM lander



SSTEF Chassis



Lander Sun View

What's Next?

Fly Your Cells on the ISS!

Orbital Electronics Lab

International Space Station – Solar Cell Test Facility



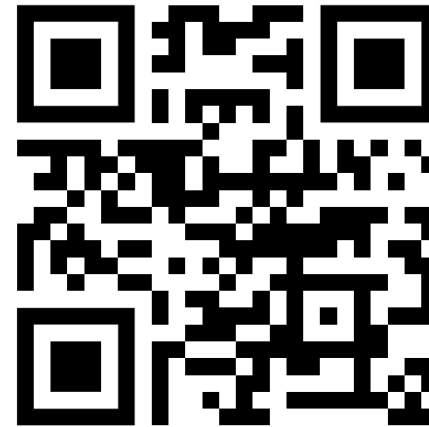
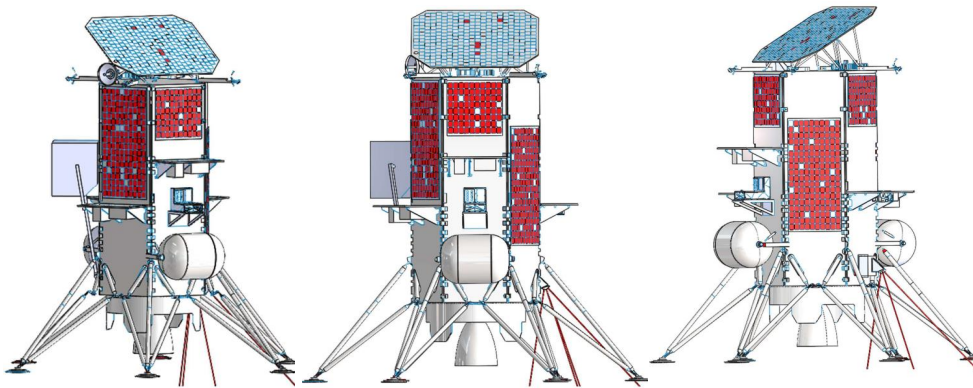
Image courtesy of NASA

- Turnkey space solar cell testing you just provide the cells!
- 6 months on-orbit with IV, temperature and sun-angle data
- Mid-flight sample pictures
- Sample return



Acknowledgements

- Aegis Aerospace: Eric Jordan, Charles Parrish
- Aerospace: Colin Mann



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SSTEF image courtesy of
Aegis Aerospace, Inc.

**ANGSTROM
DESIGNS**

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Designed and manufactured in
the United States

