



A Printed Circuitboard Analyzer for Characterizing the Charge and Mass of Martian Dust

Daniel Austin, Brigham Young University

Target: Measure size and electrical charge on dust in Mars atmosphere

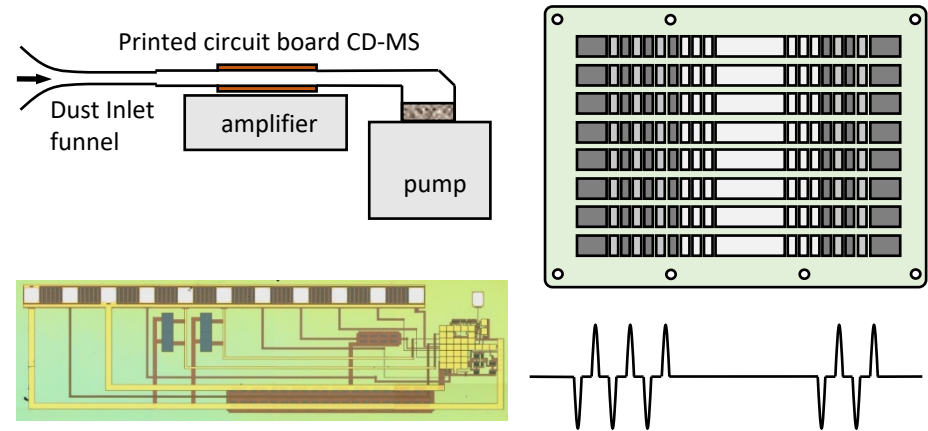
Science:

- First measurement of charge of Mars dust
- First measurement of particle size distribution
- Correlated size and charge measurements
- Clarify models of dust charging, dust transport, radiative balance, and surface-atmosphere interaction
- Help assess dust hazard to ISRU oxygen production and other systems
- Reduce risk of future crewed Mars mission

Objectives:

- Develop prototype dust analyzer based on charge-detection mass spectrometry
- Develop improved charge-sensitive amplifier
- Testing with relevant particle sizes and types
- Advance from TRL 2 to TRL 3

CoIs: Aaron R. Hawkins and S.H. Wood Chiang, Dept. of Electrical and Computer Engineering, Brigham Young University



Top L: basic instrument diagram; Bottom L: layout of ultra-low noise amplifier; Top R: layout of 8-channel dust analyzer; Bottom R: expected signal from a dust grain passing through a single channel of analyzer.

Key Milestones:

- Build single-channel CD-MS, test with COTS amplifier (7/18)
- Build and test custom amplifier (10/18)
- Build multi-channel CD-MS, integrate custom amplifier (4/19)
- Test with particle standards and dust simulants in relevant pressure and flow rates (7/20)

TRL 2 to 3