



CRATER: Characterization of Regolith and Trace Economic Resources

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Platform: The CRATER investigation, which is suited for deployment on a variety of commercial lunar lander concepts, is sufficiently versatile to be adapted for future lander/rover concepts

Science:

- Critically assess the refractory element enrichment of the silicate fraction of the Moon
- Quantify the depletion of the lunar surface with regards to moderately volatile elements
- Support geochronology ambitions by measuring K abundances with high precision/accuracy
- Characterize the inventory of prebiotic organics accumulated via meteoritic/cometary infall
- Identify strategic economic resources, including water reserves (via halogens) and metal deposits

Objectives:

- Complete system-level mechanical design, verify structural integrity via finite element modeling
- Manufacture Engineering Test Unit (ETU), validate capabilities prior to and following qual testing
- Expose ETU to GEVS Qual-level random vibration, thermal cycling, and DHMR conditions
- Collect ground-truth measurements of lunar analogs for comparisons to state of the art

CoIs: NASA GSFC, Univ. Michigan SPRL, SPEI, Thermo Scientific, and the CosmOrbitrap Team

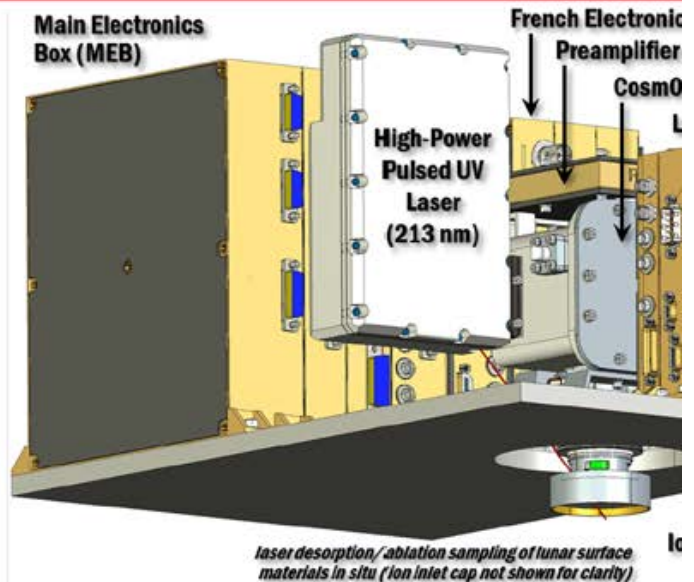


Fig. 1. The CRATER investigation enables the comprehensive chemical characterization of lunar surface samples via laser ablation processing and ultrahigh resolution Orbitrap mass spectrometry.

Key Milestones:

- Q4 PY1: Preliminary Design Review (PDR)
- Q3 PY2: Completion of laser subsystem build
- Q1 PY3: First end-to-end system performance
- Q2 PY3: Random vibration and TVAC qualification
- Q3 PY3: DHMR exposure and organization of initial TRL assessment

Entry TRL 4 ... Exit TRL 6

Development and Advancement of Lunar Instruments (DALI)