Submillimeter Solar Observation Lunar Volatiles Experiment (SSOLVE)

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**Platform:** Lander; adaptable to Orbiter

**Science:**
- Establish whether Moon’s atmosphere is truly a surface-bounded exosphere.
- Discriminate between models of indigenous or exogenous water.
- Observe water in process of horizontal transport
- Identify chemical state – H$_2$O or OH
- Evaluate total volatile water budget

**Objectives:**
- Raise TRL of 2.5 THz receiver from 4 - 6
- Validate optical design and instrument package
- Demonstrate performance of receiver over 10-70°C temperature range
- Test & Select THz radome and absorber material
- Advance Heliostat Scan Assembly (HSA) TRL to 6
- Optimize duty cycle for power, thermal management, and measurement uncertainty
- Conduct vibration & thermal vacuum tests
- Raise SSOLVE TRL to 6 by demonstrating measurements in relevant environment
- Develop Flight Mission and Implementation Plan to infuse SSOLVE technology

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**Partners:** Virginia Diodes, Inc. & Newton Engineering

**SSOLVE Instrument**
Size of 6U Cubesat, ~11 Kg
2.5 THz & 533 GHz Rcvrs
Avg Power: 8 - 27 W
duty cycle 20 - 100%
Heliostat Scan Assembly
internal cal & whole sky view

SSOLVE quantifies the principal components of water in Moon’s exosphere by measuring submm solar absorption of H$_2$O, OH, and HDO

**Key Milestones:**
- Authority to proceed 1/2019
- Requirements Review 5/2019
- Preliminary Design Review 11/2019
- THz Rcvr Prototype test (TRL 5) 4/2020
- HSA verification/function (TRL 5) 7/2020
- Antenna/Optics test (TRL 5) 5/2020
- Critical Design Review 7/2020
- Instrument Ambient test (TRL 5) 8/2021
- SSOLVE Instrument at TRL 6 10/2021
- SSOLVE Flight Mission Plan 12/2021

**TRL 4 to 6**

Development and Advancement of Lunar Instruments (DALI)