

Master Thesis

Investigation of the mechanical contact between the rover permittivity sensor wheel and lunar regolith

experimental thesis

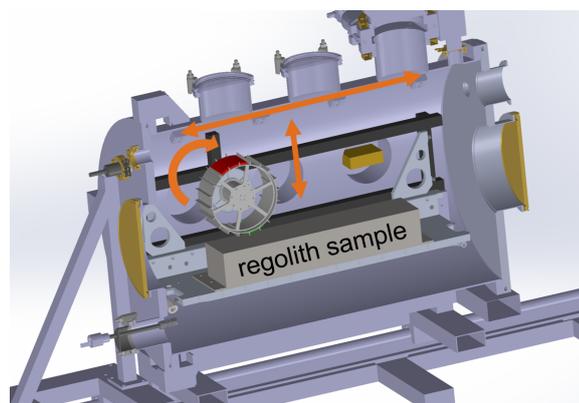
Start date: immediately possible

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Topic:

The Rover Permittivity Sensor (RPS) is an instrument, built by TUM, to be integrated into the wheel of the Rashid-3 rover from MBRSC (UAE) and is expected to fly to the Moon in 2029. RPS aims to map water content in the lunar subsurface along the rover's track.

To qualify the RPS sensor design, it must be tested under representative conditions. This means cold temperature, vacuum, realistic contact with the ground (forces, rolling), and a simulated ice-regolith surface. The test setup has been prototyped and static tests outside of the vacuum chamber completed. This thesis shall optimize, finalize, and integrate the setup into a vacuum chamber. After commissioning of the setup, mechanical contact tests shall be performed under different operational conditions and wheel configurations.



Tasks:

- Familiarization with the existing test setup prototype and the theoretical background.
- Adapt and integrate the existing setup into the vacuum chamber.
- Improve experimental methodology for sample handling, surface resetting, and data acquisition (temperature, wheel force, camera).
- Investigate static and dynamic sinkage of the wheel at different simulated surface properties.
- Analyze the test data and correlate it with existing wheel sinkage models.

Requirements:

- Basic programming in Matlab or Python for data acquisition and analysis.
- Experience with CAD and drafting for manufacturing (Solidworks or NX).
- Basic experience with motor control and measurement electronics.
- Willingness for hands-on lab work in Ottobrunn.
- Bonus: Experience with regolith simulants, soil mechanics, and vacuum hardware.

Supervisor:



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