Professorship of Lunar and Planetary Exploration Technologies
TUM School of Engineering and Design
Technical University of Munich

**Master Thesis (potentially Term Paper/Research Internship)**

# Vacuum slip ring dynamics test rig for lunar regolith environments

*theoretical/experimental thesis*
Start date: immediately possible

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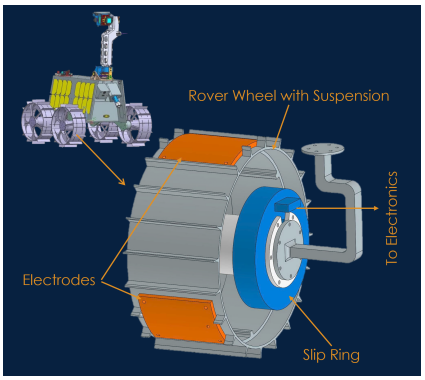
## Topic:

The Rover Permitivity 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 fly to the Moon in 2028. The sensor consists of two electrodes which are mounted to one of the rover's wheels and connected via a slip ring to the sensor's electronics inside the rover. The accommodation of the electrodes on the rover wheel allows RPS to map the regolith's water content in the lunar subsurface along the rover's track.




To qualify brush and sealing designs for the RPS slip ring, we need a motorized test rig that can operate in vacuum and tolerate lunar regolith dust. This thesis shall design and build the testing setup into a vacuum chamber while balancing setup complexity with test realism. The rig shall measure channel several electric and thermal properties during rotation in a defined dusty environment. A well defined system to apply dust to the slip ring shall be built as a part of the setup to test different sealing options of the prototype slip ring.

## Tasks:

- Define test requirements and success criteria for dynamic slip ring testing in vacuum with dust.
- Concept design of a motorized horizontal rig with vacuum compatibility and dust protection.
- Design the dust application subsystem and evaluate options.
- Plan and execute sealing trade-off tests with the current prototype.
- Analyze the test data and recommend the best sealing option.

## Requirements:

- Hands on skills in lab assembly and testing.
- Basic programming in Matlab or Python for data acquisition and analysis.
- Experience with CAD (Solidworks or NX)
- Basic experience with motor control and measurement electronics. Ability to design or integrate simple electronic circuits.
- Bonus: Experience with regolith simulants

## Supervisor:

**Rok Sesko**

Postal address
Lise-Meitner-Straße 9
85521 Ottobrunn

Contact
Phone: +49 (89) 289 - 55682
*rok.sesko@tum.de*