

Investigation on Ground Station Modifications for VLEO Satellite Mission Support

The collaborative research center (CRC) "Advancing Technologies of Very Low Altitude Satellites (ATLAS)" at the University of Stuttgart, funded by the German Research Foundation (DFG), addresses the fundamental scientific and engineering challenges of rendering Very Low Earth Orbit (VLEO) accessible and extending satellite lifetime by an order of magnitude. As part of this research project, the fundamentals of VLEO satellite operations are being investigated by drawing on expertise gained from operating satellites at the University of Stuttgart.

The aim of this thesis is to identify and evaluate necessary improvements for university-class ground stations to support VLEO satellite operations. Compared to conventional LEO missions, satellites in VLEO face major challenges in Telemetry, Tracking, and Command (TT&C) due to higher orbital velocities and rapidly changing atmospheric conditions. Ground station tracking methods based on pre-calculated mean orbital predictions, such as Two-Line Elements (TLEs), often become unreliable because of rapid orbital decay, while mechanical hardware limitations can further affect tracking. Together, these factors can lead to critical communication interruptions. To address this, the thesis investigates potential hardware and software upgrades for ground stations, focusing on the IRS ground stations at the University of Stuttgart.

Your tasks

- Familiarization with VLEO satellite operations and the respective challenges
- Research on existing ground station systems and assessment of their capabilities
- Identification of key limitations and technical challenges in supporting VLEO missions
- Investigation of potential strategies and technologies to overcome these limitations
- Analysis of the IRS ground station and definition of required modifications for VLEO compatibility
- Evaluation of the feasibility and benefits of an auto/multimode tracking system at IRS
- Documentation

Contact:

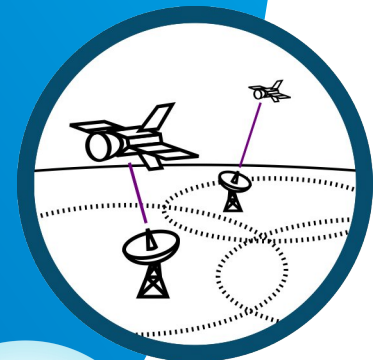
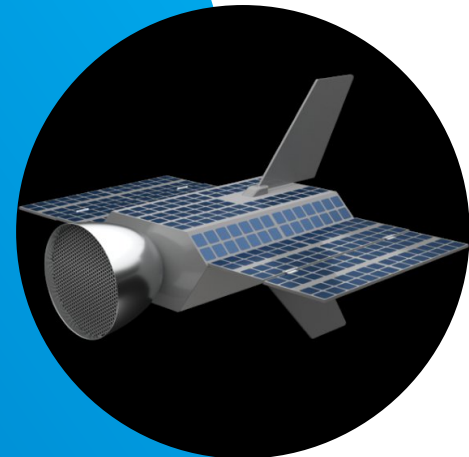
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