Announcement for a

Master Thesis on the Balloon Gondola Pointing Control System

of the STUDIO UV-astronomy mission

Background

Under the European project ESBO *DS* (European Stratospheric Balloon Observatory *Design Study*) the Institute of Space Systems (IRS) at the University of Stuttgart develops a balloon-based astronomical observatory. The goal of the project is to establish an observatory with telescopes up to the 5 m aperture class flying on a regular basis. An integral part of the project is the development of a flightworthy prototype (STUDIO). This prototype will carry a telescope with 50 cm aperture and instruments for the ultraviolet and visible spectral ranges. Thus, it will allow testing of critical technologies and first scientific observations.
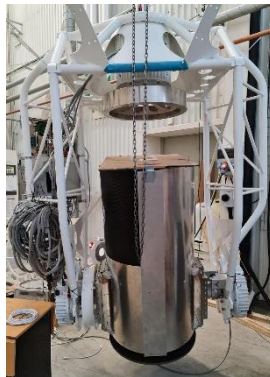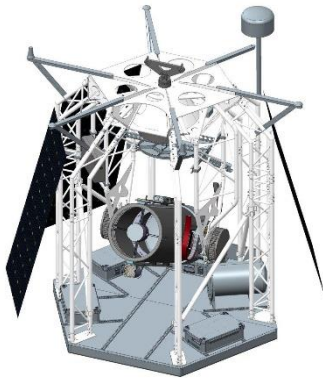
The STUDIO gondola has a total mass of approximately 800 kg and carries, in addition to the telescope with scientific instruments, all auxiliary equipment required for the control and operation of both the payload and the gondola itself. In order to allow scientific observations, it features a gondola and telescope pointing system including several different sensors and actuators to point the telescope with a stability of a fraction of a degree. While the gondola and the pointing system hardware are already built by a Swedish project partner and subcontractor, a model of the system in software, which can be used to tune the control system for flight conditions, is still required.

Thesis scope (preliminary)

- Setup of a software model (e.g. in Matlab/Simulink) of the full pointing system at flight altitude, including sensors, actuators, necessary physical models (e.g. balloon/gondola system), controllers, and disturbance input.
- Characterization of sub-models / sub-model parameters in cooperation with the manufacturer of the pointing system, based on available information and, where necessary, tests.
- Simulation of the system behaviour under flight conditions with baseline control system settings.
- Tuning of the control system based on the simulations.

Your profile

- You are a student in engineering or physics.
- You have an interest in system engineering, testing, and system modelling.
- You have first experience with control theory, particularly with modelling and/or control system design.

Most of the work will be performed in Stuttgart, but availability to travel to Sweden for the setup of the model and/or characterization of the sub-models is required.

If you are interested or for further information on STUDIO / ESBO *DS* kindly contact Philipp Maier (pmaier@irs.uni-stuttgart.de / 0711 685 60813). Further information on ESBO *DS* is also available at ebso-ds.irs.uni-stuttgart.de.