

Bachelor Thesis

Implementation of a saturation spectroscopy unit for the qualification of ultra-high vacuum suitable alkali metal sources

Basics:

Quantum physics is becoming more and more attention from science and economy. Often alkali-metals evaporated in an ultra-high vacuum are used as source for quantum technologies. Recently we developed a filling facility for alkali-metal sources such as ovens or dispenser in our laboratories. The next step is to qualify existing ovens with a saturation spectroscopy unit for space based missions.



Figure 1: Laboratory set up for oven testbed and oven components in the assembly process

Topic of the project:

Enabling technologies for quantum physical experiments is a completely new field for engineers. As developer of quantum physical experiments on-board of sounding rockets (MAIUS I&II) and the International Space Station (BECCAL) the ZARM is having major expertise for quantum technologies. In the framework of MAIUS and BECCAL the testing of performance and reliability of alkali-metal sources is crucial for the success of the missions.

Figure 2: Oven components

In this thesis the student shall assemble the optical bench for the qualification of the alkali-metal sources and measure the first partial pressure behavior of the source at different temperatures. Therefore the existing setup shall be evaluated and adapted. The existing software for the laser control and oscilloscope shall be used to extract first results for the prototypes.

We are looking for students with:

- Good knowledge in CAD (e.g. Autodesk Inventor...)
- Good knowledge of Physics (e.g. spectroscopy...)
- Basic knowledge of programming (e.g. Python, LabView)
- Experience with electrotechnic (e.g. oscilloscopes, photodiodes...)

We offer:

- Equipped laboratory
- Direct Support
- Participation in our DLR/NASA projects

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