

Master thesis

Joint lab Integrated Quantum Sensors – O. Fartmann, Dr. M. Krutzik

Design of a compact optical frequency standard at 689nm for space applications based on a cooled strontium beam

As part of our activities on frequency references based on atomic strontium we are looking for highly motivated Master students in the fields of experimental physics, optical sciences and/or engineering.

Apart from field- and lab-based applications in metrology and sensing, compact and rugged optical frequency references receive increased attention with respect to space-borne operation. In current and planned earth-observation and fundamental science missions, inter-spacecraft ranging relies on stabilized lasers. Optical clocks built around those references using frequency combs could address a variety of precision timing applications. For example, such a device and the underlying key technologies are candidates for next-generation GNSS core equipment.

We are currently setting up a system for investigating the 7.6 kHz broad $^1S_0 \rightarrow ^3P_1$ intercombination line in ^{88}Sr . Using an optical Ramsey technique, we intend to perform high resolution spectroscopy on thermal strontium beams probed by a cavity pre-stabilized 689nm diode laser. In a second setup we will perform spectroscopy on a 2D-laser-cooled beam and compare the achievable performances.

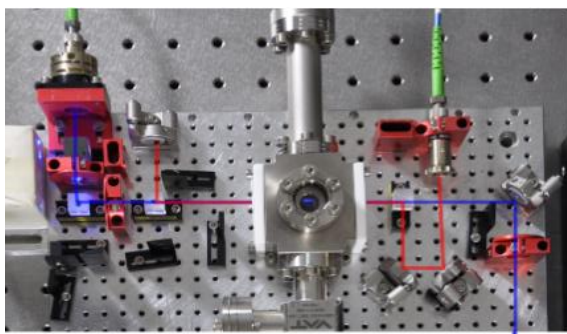


Figure 1: Current setup @ HUB with a thermal Sr source

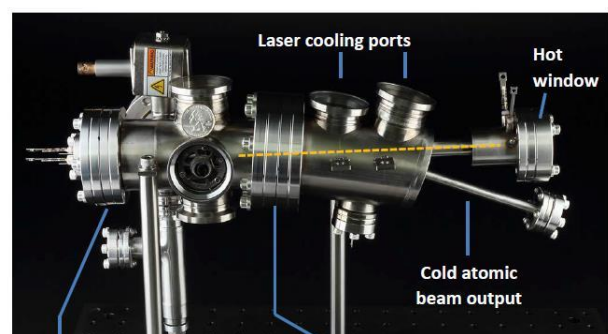


Figure 2: Future setup providing a laser-cooled source of Sr

The activities of the Master thesis aim at the design and assembly of laser sources, optical systems and spectroscopy. A background in laser physics, spectroscopy or optical technologies is desired. If you're interested don't hesitate to contact us.

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