*In the Atomic-, Molecular- and Laser Physics group at LaserLaB VU Amsterdam one 4-year **PhD position** (OIO) and 1 year **Postdoc** is available in experimental AMO physics*

1 PhD position + 1 year Postdoc position

Ultracold helium elevator and interferometer for measuring α

The project aims to build an elevator and interferometer for ultracold ^{4}He atoms (temperature ≈ 0.2 μK). The goal is to accelerate the atoms in a standing-wave light field and measure the velocity increase in an atom interferometer setup. As the atoms scatter many photons during acceleration the recoil velocity, due to the transfer of the momentum of one photon to the atom, can be measured with high precision. This allows an extremely accurate determination of one of the fundamental constants of nature, the fine-structure constant α. Confrontation of this value with a value of α, deduced from a measurement of the g-factor of the electron, provides the most stringent test of Quantum Electrodynamics theory possible today.

A new experimental setup is presently built for this project. In the experiment (see [1] for background information on a similar project in the lab) an atomic beam of helium atoms is decelerated in a Zeeman slower and the slow atoms are trapped in a Magneto Optical Trap (temperature ≈ 1 mK). Subsequently the atoms are evaporatively cooled towards Bose-Einstein condensation. A million Bose-condensed atoms will then be trapped inside a standing wave consisting of two counterpropagating laser beams with slightly different frequency, launching the atoms upwards in steps of twice the one-photon recoil velocity, 9.2 cm/s. To measure the velocity increase with high accuracy the atoms will be coherently split and recombined by Bragg scattering (atom interferometer).

The PhD and Postdoc positions are open starting Sept. 1, 2014. The positions are funded by the foundation for Fundamental Research on Matter (FOM), with full FOM PhD salary and benefits (see http://www.fom.nl for details). An MSc Physics (or comparable) degree is required for the PhD position. Experience in experimental physics, preferentially cold-atoms or AMO physics, is mandatory. In the lab the appointed students will work together in the 'cold atoms and quantum gases' team of 4 PhD students and one advanced researcher. For the PhD student a 3 months research stay at Ecole Normale Superieure in Paris is planned to study a similar experiment on Rb [2].

You can send your application or inquiries by email to the PI of the project, dr. W. Vassen (w.vassen@vu.nl). Please include a letter of motivation, your CV, and names with email addresses of references.

[1] R. van Rooij et al., Science **333**, 198 (2011)
[2] R. Bouchendira *et al.*, Phys. Rev. Lett. **106**, 080801 (2011).

See also http://www.nat.vu.nl/en/research/atoms_molecules_lasers/jobs/