CFEL SCIENCE

SEMINAR

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Building 49, Seminar Room (108)

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Excitation and Detection of Rydberg Atoms in an Ultracold Gas

– Electric Field Design and Electromagnetically Induced Transparency –

Rydberg atoms are atoms with (at least) one electron in highly excited states. Due to their rich internal structure and strong electronic properties, Rydberg atoms have been studied in atomic physics for more than a century. This talk reports on the development and assembling of two key elements towards a next generation experiment for ultracold Rydberg gases.

In order to control electric fields and to detect Rydberg atoms dependent on their state and position, a new detector is simulated and constructed. Simulations predict homogeneous ionization fields of less than 1% deviation and residual fields of maximal 5mV/cm in the excitation volume.

The field plates allow to create field gradients that can be used to address the Rydberg atoms depending on their position. The detector is mounted as one piece to a flange, and combines large optical access and modularity with the above mentioned properties.

Besides the development of the detector, the frequency stabilization of one of the excitation lasers (TA-SHG at 480 nm) is presented. It is stabilized using electromagnetically induced transparency in a hot rubidium vapor cell.

Host: Jochen Küpper - Coherent Imaging Division - Controlled Molecule Imaging Group