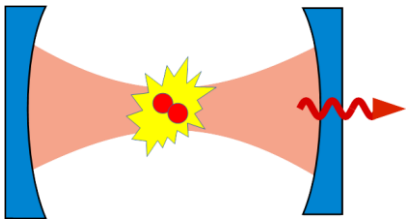
PhD position at the Institute for Quantum Matter, University of Ulm

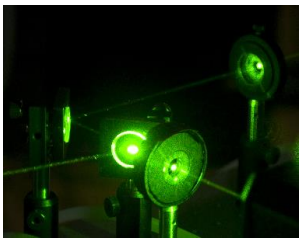
Ultracold chemistry in optical cavities

Laser-cooled atoms enable to study molecular binding mechanisms on a fundamental level and to create molecules in exactly defined quantum states. Ultracold molecules are a young and dynamical research area in quantum optics combining full control on the single-atom level with additional degrees of freedom (vibration, dipole moments etc.) of multi-atom molecules.

An important method to create ultracold molecules is photoassociation: here, a laser photon takes unbound atom pairs into a bound, electronically excited state. From there, they can decay into several bound long-lived states.

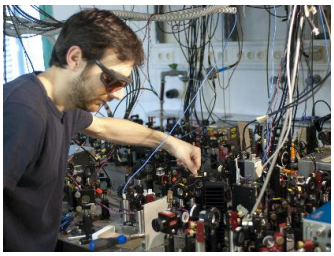
In our project, we want to control the spontaneous decay process in photoassociation using an optical microcavity (resonator) for the first time. The photon which is emitted during the decay process will be detected. Moreover, the optical microcavity will be used to detect ultracold molecules non-destructively. This would open up a new field in the area of quantum and molecular physics.





The PhD project will be carried out at an experimental setup which can routinely produce Bose-Einstein condensates and ultracold molecules. In the framework of the project, the optical microcavity will be integrated into the vacuum apparatus and changes of the laser system and the computer control system will be made.

The candidate should be skilled and enjoy dealing with optics and electronics: here, you can gain many practical experiences with lasers, optics, vacuum equipment, control engineering and programming. A solid understanding of atomic physics, optics and quantum mechanics will be useful.



The project takes place in the framework of the *Center for Integrated Quantum Science and Technology* (IQ^{ST}) in collaboration with the Institute for Theoretical Chemistry of the University of Stuttgart (Prof. Dr. Andreas Köhn).

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