Michael Johanning

Universität Siegen

Scalable Quantum Information Processing in ion traps using MAGIC

Ion traps are one of the promising platforms for quantum information processing and many proof of principle experiments have been realized with laser cooled trapped ions. A recent development is the application of inhomogeneous magnetic fields and microwave radiation for selective coherent manipulation and conditional dynamics. This allows for long coherence times and high fidelity one and two qubit gates, as demonstrated recently.

In this talk, I will focus on the storage, manipulation and readout of qubits encoded in the spin degree of freedom which can interact, upon application of an additional magnetic field gradient, by a magnetic gradient induced coupling (MAGIC). I will illustrate the concepts using results obtained with macroscopic and micro-structured traps, and compare to atomic qubits manipulated by optical means.