Yb Atom Arrays for Collective Light-Matter Interfaces and New Qubit Architectures

Alex Burgers, U of M

Optical tweezers enable the assembly of dynamically configurable arrays of single atoms with near-arbitrary geometry, providing a platform for controlled studies of collective light-matter interactions. In this talk, I will describe our work using long-wavelength transitions in ytterbium (Yb) from the triplet metastable manifold to investigate cooperative radiative effects and to develop new elements for quantum photonics. In closely spaced atomic arrays, interactions will strongly modify the system's optical response, and the array can approach near-unity reflectivity, functioning as an atomic mirror. I will present our work toward this goal, including the creation of programmable 2D Yb arrays, initialization into the metastable state, and ongoing efforts toward observing the long-wavelength transitions in Yb. More broadly, engineering the radiative response of atomic arrays has applications in quantum memories, sensing, and the generation of non-classical states of light using atom-photonic elements.