A new quantum computing platform based on Yb atoms in optical tweezer arrays

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Alkaline earth-like atoms are promising candidates for the next-generation fault-tolerant quantum computing platforms. We are currently developing a new experiment based on fermionic 171Yb atoms in programmable arrays of optical tweezers. The optical tweezer array offers a platform in which the geometry of the atoms can be arbitrarily reconfigured by programming the phase mask imprinted on the tweezer laser beam using a spatial light modulator (SLM). Rapid rearrangement of atoms within the tweezer array sites can also be performed using a pair of acousto-optic deflectors (AODs). The two nuclear spin states of 171Yb will be used as robust and long-lived qubits, with the metastable clock state offering the possibility of implementing quantum error correction protocols, exploiting ground and metastable states as ancilla and data qubits. Multiqubit gates will be implemented exploiting state-selective coupling to Rydberg states.