Rubidium Atoms in Tweezer Arrays for Hybrid Quantum Computing

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Our project has the goal of building a quantum co-processor consisting of neutral atoms in tweezer arrays. This quantum co-processor will form part of an online-accessible hybrid quantum computer tailored for solving quantum chemistry problems.

In this collaborative project between a team at the Eindhoven University of Technology (TU/e) and a team at the University of Amsterdam (UvA) there are three setups: a demonstrator system using rubidium atoms at TU/e, the existing 1st generation strontium-based system at UvA and the 2nd generation strontium-based system at TU/e which is being constructed.

In this poster we present the status of our rubidium-based system, which is used to test various components and techniques which will be used in the 2nd generation strontium-based system. In particular we present our progress towards trapping single ^{85}Rb atoms in arrays of optical tweezers, creating defect-free arrays from stochastically filled arrays via rearrangement, characterization measurements of the trapping potential experienced by the trapped atoms which will be used to feedback on the optical traps to increase uniformity over the array and our plans to implement single qubit rotations on the hyperfine ground states of these atoms by combining global microwave pulses and an AC Stark shifting laser beam for site selectivity.