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Tweezer Arrays for Rydberg States in Erbium for Quantum Simulation ARNO TRAUTMANN, PHILIPP ILZHOEFER, BENEDIKT HOCHREITER[1], Institute for Quantum Optics and Quantum Information Innsbruck, MANFRED MARK[2], FRANCESCA FERLAINO[3], Institute for Quantum Optics and Quantum Information Innsbruck, University of Innsbruck — We present our design for a novel platform for quantum simulation based on Rydberg states in erbium confined in optical tweezers. Rydberg atoms are promising candidates for quantum simulation due to their extremely strong and long-range interactions, and have been applied already very successfully in alkali atoms. However, the simple electronic structure with only one valence electron can pose limitations to the tool box of control and manipulation of Rydberg states. Trapping, cooling or direct imaging cannot be done in a straigthforward way. Therefore, Rydberg states in multi-electron atoms are promising new platforms, as shown in recent studies in strontium and ytterbium. We plan to use erbium atoms, which have two valence electrons in their outer 6s shell and 12 electrons in an open, sub-merged, 4f shell. The properties of Rydberg states in such a complex system are not yet well understood and require intense spectroscopic effort. We here present our design for a new experiment dedicated to the study of these states in controllable arrays of optical tweezers.

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