Supersymmetry in Rydberg-dressed lattice fermions

HENDRIK WEIMER, Harvard University, ITAMP, LIZA HUIJSE, Harvard University, ALEXEY GORSHKOV, Caltech, GUIDO PUPILLO, University of Strasbourg, PETER ZOLLER, University of Innsbruck, IQOQI, MIKHAIL LUKIN, EUGENE DEMLER, Harvard University — Supersymmetry is a powerful tool that allows the characterization of strongly correlated many-body systems, in particular in the case of supersymmetric extensions of the fermionic Hubbard model [1]. At the same time, these models can exhibit rich and exotic physics on their own, such as flat bands with a vanishing dispersion relation. We show that such lattice models can be realized with Rydberg-dressed fermions in optical lattices. Strong interactions within the ground state manifold of the atoms can be realized by admixing a weak contribution of a highly excited Rydberg state [2]. We discuss the unique possibilities of ultracold atoms for the detection of supersymmetry and the effects of tuning the system away from the supersymmetric point.