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Many-body physics and exotic states in Rydberg systems

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In recent years, experiments using cold atoms in Rydberg states have emerged as a powerful platform for the quantum simulation of condensed matter Hamiltonians with extended-range interactions (ERI). This perspective for experimental realization has led to strong cross-fertilization between atomic and condensed matter physics, with considerable theoretical work being dedicated to the study of ERI Hamiltonians. As a result, several interesting equilibrium and out-of-equilibrium scenarios have been discovered in this kind of system.

I will present my numerical results for two classes of ERI Hamiltonians: namely, i) the determination [1] of the phase diagram of the Fendley-Sengupta-Sachdev model (recently realized via quantum simulation in Rydberg atom experiments) in the so-called doubly-blockaded regime, where the critical behavior of the system is still not fully understood, and ii) the demonstration of a phase transition between two supersolid states in an extended Bose-Hubbard model, whose interactions are of interest for experiments with atoms in Rydberg-dressed states.

[1] G. Giudici, AA, G. Magnifico, Z. Zeng, G. Giudice, T. Mendes-Santos, M. Dalmonte, Phys. Rev. B **99**, 094434 (2019)

Summary

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Classifica Sessioni: Posters and Coffee

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