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Magnetism and spin squeezing with arrays of Rydberg atoms

jeudi 6 juillet 2023 08:30 (40 minutes)

This talk will present our recent work on the use of arrays of Rydberg atoms to study quantum magnetism and to generate entangled states useful for quantum metrology. We rely on laser-cooled ensembles of up to hundred individual atoms trapped in microscopic optical tweezer arrays. By exciting the atoms into Rydberg states, we make them interact by the resonant dipole interaction. The system thus implements the XY spin ½ model, which exhibits various magnetic orders depending on the ferromagnetic or antiferromagnetic nature of the interaction. In particular, we adiabatically prepare long-range ferromagnetic order, and we probe the dispersion relation of the system. When the system is placed out of equilibrium, the interactions generate spin squeezing. We characterize the degree of squeezing and observe that it scales with the number of atoms.

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