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CERLA

« Quantum Simulation with Giant Atoms »
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Rydberg atoms with their large distance of their outermost electrons to their atomic core exhibit remarkable properties such as strong dipolar interactions. They can be coherently controlled using laser and microwave fields and ar currently promising candidates to become the building blocks of quantum computing platforms.
In my talk, I will present how Rydberg atoms can be employed for quantum simulation of spin models, such as Heisenberg and Ising models, enabling the study of magnetic systems. We have developed versatile methods to engineer the interaction between quantum spins, including the capability to implement time reversal of the many-body spin dynamics. Using these techniques, we have investigated the dynamics of spin systems with tunable disorder. Our observations reveal slow relaxation dynamics, indicating the emergence of localized pairs, as well as hysteresis in the magnetic susceptibility for low energies. These findings raise fundamental questions about the nature of this low-energy regime and its possible connection to a spin-glass phase.