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Simulating Quantum Spin Models with Trapped Ytterbium Ions[1]

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— Simulating large quantum many-body systems is practically impossible with classical computers, as it requires resources exponential in the system size. An array of cold trapped ions has recently been identified as a promising candidate for exploring many-body spin Hamiltonians. This is due to superb control of their quantum states and interactions, high-fidelity spin state detection of each and every ion, and very long coherence time. We will initially work with less than 10 ions, but will speculate on how this may be scaled up to larger numbers of spins. We will report the recent progress toward quantum simulations of Heisenberg-like spin Hamiltonians [1] with trapped Ytterbium ions in a linear Paul trap.

[1] D. Porras and J. I. Cirac, Phys. Rev. Lett. **92**, 207901 (2004)

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