

## Quantum Simulation of Magnetism with Ytterbium Ions

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An array of cold trapped ions has recently been identified as a promising physical implementation of a quantum simulator [1,2], thanks to the tunable long range couplings between ions and its advanced status on quantum computation applications. In particular, ions coupled by tightly bound transverse normal modes allows more efficient cooling and wide tunability of the effective spin-spin couplings. We will report our most recent simulation results of quantum spin Hamiltonians with few trapped ytterbium ions, coupled by transverse modes. We will also discuss on how this may be scaled up to a much larger number of spins with anharmonic traps and using multiple transverse modes.

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

[2] A. Friedenauer1 et al., Nat. Phys. **4**, 757 (2008)