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Realizing SU(N) magnets in thermal alkaline-earth gases MICHAEL BEVERLAND, Cal Inst of Tech (Caltech), ALEXEY GORSHKOV, Joint Quantum Institute, NIST, and University of Maryland, ANA MARIA REY, JILA, NIST, and Department of Physics, University of Colorado Boulder, GORJAN ALAGIC, IQIM, Cal Inst of Tech (Caltech) — We show that thermal fermionic alkaline-earth atoms in flat-bottom traps allow one to implement a spin model displaying two symmetries: the symmetry that swaps atoms occupying different vibrational levels of the trap and the SU(N) symmetry associated with N nuclear spin states. The high symmetry allows us to analytically calculate the full spectrum, the eigenstates, and the dynamics. Armed with such a solid understanding, we show how this system can be used to generate entangled states usable for Heisenberg limited metrology (e.g. clocks), to make measurements useful for quantum information processing, and to understand spin diffusion in SU(N) systems. The best news is that this highly symmetric spin model should be readily realizable even when the vibrational levels are occupied according to a high-temperature thermal or a non-thermal distribution.

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