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Rydberg-Dressed Ising Interactions for Quantum Simulation and Metrology[1] SHANKARI RAJAGOPAL, VICTORIA BORISH, OGNJEN MARKOVIC, JACOB HINES, MONIKA SCHLEIER-SMITH, Stanford Univ — Rydberg dressing provides a means of realizing optically controllable long-range interactions between neutral atoms. Theoretical proposals envision leveraging these interactions to simulate frustrated quantum magnets, access new non-equilibrium phases of matter, or engineer metrologically useful entangled states. Here, we present experimental results on the emulation of a transverse-field Ising model using a cold bulk gas of Rydberg-dressed cesium atoms (*arXiv:1910:13687*). We observe Ising dynamics which manifest as one-axis twisting, holding promise for creation of squeezed spin states, and detect dynamical signatures of the paramagnetic-ferromagnetic phase transition. We additionally discuss progress towards combining our current Rydberg-dressing capabilities with the spatial control of optical tweezers, to enable applications in quantum simulation and combinatorial optimization.

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