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Exploring the phase diagram of the transverse-field Ising model using trapped ions K.R. ISLAM, S. KORENBLIT, K. KIM, M.-S. CHANG, E.E. EDWARDS, C. MONROE, JQI- University of Maryland Department of Physics and National Institute of Standards and Technology , G.-D. LIN, L.-M. DUAN, FOCUS Center and MCTP, Department of Physics, University of Michigan, J. FREERICKS, Department of Physics, Georgetown University — We explore the phase diagram of transverse-field long range Ising model using a linear chain of ^{171}Yb+ ions with two hyperfine energy levels of each ion mapped to the two spin-1/2 states. The system is prepared close to the ground state of an initial Hamiltonian with transverse field much larger than the tunable spin-spin interaction and the field is then adiabatically lowered to a value where the probabilities of different magnetic orders are measured. The phase diagram contains interesting features such as quantum phase transitions and first order transitions due to frustration *i.e.*, competition between spin-spin couplings. This work is supported by the Army Research Office (ARO) with funds from the DARPA Optical Lattice Emulator (OLE) Program, IARPA under ARO contract, the NSF Physics at the Information Frontier Program, and the NSF Physics Frontier Center at JQI.

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