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Tunable Collective Modes in the Dilute Ising Magnet $\text{LiHo}_{0.045}\text{Y}_{0.955}\text{F}_4$ D.M. SILEVITCH, California Institute of Technology, G. AEP-PLI, Paul Scherrer Institute, T.F. ROSENBAUM, California Institute of Technology — Collections of quantum mechanical spins with dipolar interactions exhibit a complex set of states and excitations due to the long range and alternating sign of the dipolar potential. We use nonlinear ac magnetic susceptibility on the dilute dipole Ising magnet $\text{LiHo}_{0.045}\text{Y}_{0.955}\text{F}_4$ to study the behavior of coupled clusters of spins. Pump-probe spectroscopy excites Fano resonance behavior between coherent, isolated spin clusters and a background spin bath. The evolution of these clusters exhibits universal behavior as a function of several different tuning parameters such as static transverse field, ac pump field, and thermal connectivity to a heat reservoir. We discuss our results within the framework of many-body localization.

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