

Low-temperature properties of the dilute dipolar magnet LiHoF₄

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The rare-earth compound LiHoF₄ is used as model magnet to investigate diverse magnetic phenomena such as quantum phase transitions, spin-glass behavior and quantum annealing. Due to the tightly bound 4f electrons and a strong anisotropy caused by the crystal field the material is believed to be a very good realization of a dipolar Ising model. Using a Monte Carlo method we calculate the susceptibility and specific heat for the dilute model, and compare our results to recent experiments. Our calculations reproduce the experimentally observed phase diagram, except for the low-temperature freezing of the spin glass. We reach qualitative agreement with early susceptibility measurements, but our results for the specific heat differ from recent experiments.