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On the ordering of Ising spin glasses in a field HELMUT G. KATZGRABER, Theoretische Physik, ETH Zurich, CH-8093 Zurich, Switzerland, THOMAS JORG, LPTMS, UMR 8626 CNRS et Univ. Paris-Sud, 91405 Orsay CEDEX, France, FLORENT KRZAKALA, Laboratoire PCT, UMR Gulliver CNRS-ESPCI 7083, 10 rue Vauquelin, 75231 Paris CED — We study the existence of a spin-glass phase in a magnetic field in three space dimensions using a novel approach where the Monte Carlo simulations are performed along a nontrivial path in the magnetic field–temperature plane which must cross any putative de Almeida-Thouless line. The method is first tested on the mean-field version of the Edwards-Anderson Ising spin glass on a Bethe lattice where we compute analytically the instability line that separates the spin glass from the paramagnetic state. While the de Almeida-Thouless line is clearly reproduced by our simulations on the mean-field Bethe lattice, no such instability line can be found numerically for the short-range three-dimensional model. We thus conclude that there is no such instability line for three-dimensional short-range Ising spin glasses.

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