

Abstract Submitted  
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**Extremal Optimization for Ground States of the Sherrington-Kirkpatrick Spin Glass with Levy Bonds**<sup>1</sup> STEFAN BOETTCHER<sup>2</sup>, Physics Dept., Emory University — Using the Extremal Optimization heuristic (EO),<sup>3</sup> ground states of the SK-spin glass are studied with bonds  $J$  distributed according to a Levy distribution  $P(J) \propto 1/|J|^{1+\alpha}$  with  $|J| > 1$  and  $1 < \alpha < 4$ . The variation of the energy densities with  $\alpha$ , their finite-size corrections, their fluctuations, and their local field distribution are analyzed and compared with those for the SK model with Gaussian bonds.<sup>4</sup> We find that the energies attain universally the Parisi-energy of the SK when the second moment of  $P(J)$  exists ( $\alpha > 2$ ). They compare favorably with recent one-step replica symmetry breaking predictions well below  $\alpha = 2$ . Near  $\alpha = 2$ , the simulations deviate significantly from theoretical expectations. The finite-size corrections exponent  $\omega$  decays from the putative SK value  $\omega_{SK} = \frac{2}{3}$  already well above  $\alpha = 2$ . The exponent  $\rho$  for the scaling of ground state energy fluctuations with system size decays linearly from its SK value for decreasing  $\alpha$  and vanishes at  $\alpha = 1$ .

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<sup>3</sup>S. Boettcher & A.G. Percus, *PRL* **86**, 5211 (2001)

<sup>4</sup>S. Boettcher, *Philosophical Magazine* **92**, 34 (2012)

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