

Criticality of structurally-disordered spin systems with weak long-range interactions

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Studies of low-temperature ordering in long-range interacting many-particle systems continue to attract significant interest. While such systems are common in nature, some features of their critical behavior remain unexplained. We address the combined impact of weak structural disorder and weak long-range interactions decaying in d -dimensional space as $x^{-d-\sigma}$ with $\sigma > 0$ on the critical behavior of classical model with n -component spins. Within specific regions of the parameter space (n, d, σ) , this model exhibits a distinct disorder-induced long-range universality class. To characterize this universality class we calculate the marginal dimensions [1] and scaling exponents [2,3] governing the system's criticality within the three-loop approximation of field-theoretical renormalization group approach. Furthermore, we present refined estimates of these universal quantities by applying resummation techniques to the divergent perturbation series.

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- [3] D. Shapoval, M. Dudka, *Condens. Matter Phys.* **28** (2025) 43503.

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