

Critical Behavior of Structurally Disordered Systems Magnets with Long-Range Interaction

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Our research aims to examine critical behavior of a magnetic system under the influence of two competing factors: long-range interaction and weak structural disorder (e.g., weak quenched dilution). We analyze ferromagnetic ordering in a structurally-disordered magnet within an n -vector model in d -dimensional space, where the long-range interaction decays with distance x as $J(x) \sim x^{-d-\sigma}$, where with σ as is the control parameter. Field-theoretical renormalization group methods (RG) are used to identify the system's universality classes, and the universal characteristics of critical behavior depending on the global parameters d, n, σ . We demonstrate that there exists a parameter region (d, n, σ) , where the interplay of long-range interaction and structural disorder leads to emergence of a new structural-disorder-induced long-range universality class. Using fixed spatial dimension approach we extract values of correlation length critical exponent ν characterizing this class from perturbative RG functions at $d = 3$ applying asymptotic series resummation methods.

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