Thermodynamical Properties of the Blume-Capel Model in the vicinity of its Tricritical Point

Mário JG Rocha-Neto [(a)], G Camelo-Neto [(b)], E. Nogueira-Jr [(c)], S Coutinho [(d)]
[(a)] *Instituto Federal de Educação Ciência e Tecnologia de Pernambuco, Garanhuns, Brasil*
[(b)] *Universidade Federal de Pernambuco, Caruaru, Brasil*
[(c)] *Universidade Federal da Paraíba, João Pessoa, Brasil*
[(d)] *Universidade Federal de Pernambuco, Recife, Brasil*

A study was conducted on the thermodynamic properties of the Blume-Capel model near its tricritical point (TCP). The model is defined on diamond hierarchical lattices of arbitrary dimensions d. Local critical densities were calculated exactly and numerically, including magnetization m and quadrupole moment q, for each site of the lattice in every region of the temperature versus crystal-field parameter phase diagram for $d=2$ and $d=3$. Fractal and finite-size scaling analysis methods were used to explore the fractal properties and response functions associated with these densities near the TCP. Distinct and characteristic scaling behaviors were found for temperatures above, below, and at the TCP. The thermodynamic properties of the order parameter $n_0=1-q$ were also studied in detail, including the temperature $T \times n_0$ phase diagram, entropy, latent heat associated with the n_0 discontinuous transition, and response functions such as susceptibility and specific heat.