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Monopole-like configurations in the O(3) spin model at the upper critical dimension

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We present a high-precision Monte Carlo study of the $O(3)$ spin theory on the lattice in $D = 4$ dimensions. This model exhibits interesting dynamical features, in particular in the broken-symmetry phase, where suitable boundary conditions can be used to enforce monopole-like topological excitations. We investigate the Euclidean time propagation and the features of these excitations close to the the critical point, where our numerical results show an excellent quantitative agreement with analytic predictions derived from purely quantum-field-theoretical tools by G. Delfino.
We conclude by commenting on the implications of our findings for a conjectured violation of Derrick's theorem at the quantum level and on the consequences in various areas of physics, ranging from condensed matter to astro-particle physics.

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