

Abstract Submitted
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Lost and found: The missing diabolical points in the Fe_8 molecular magnet¹ FEIFEI LI, ANUPAM GARG, Northwestern University — The tunneling spectrum of the single-molecule-magnet Fe_8 is known to have diabolical points (DP's). For magnetic fields along the hard axis, there are four such points for tunneling between the ground pair of levels, whereas the simplest model including only second-order anisotropy would predict ten DP's. The difference is due to a very weak fourth-order anisotropy, which in a semiclassical picture generates instantons with endpoint discontinuities, one of which dominates for large enough fields, and having no interfering partner, causes six of the underlying DP's to go away. However, as shown by Bruno, the six missing DP's do not truly disappear, but merely move off the hard axis into the hard-medium plane. In this talk, we report on a numerical search for these “missing” DP's. This search is nontrivial because the energy surface is like a smooth golf course, on which the DP's are extremely localized and deep holes. We therefore locate the DP's by following the lines of the Berry curvature which have monopole singularities at the DP's. This exercise is performed for tunneling between excited pairs of levels also. An experimental observation of the rediscovered DP's would be an important test of the underlying spin Hamiltonian for Fe_8 . (Submitted to the arxiv: Nov. 18, 2010.)

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