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Thermodynamic properties of magnetic strings on a square lattice[1] LUCAS MOL, DENIS DA MATA OLIVEIRA, Departamento de Física, Universidade Federal de Minas Gerais, MICHAEL BACHMANN, The University of Georgia — In the last years, spin ice systems have increasingly attracted attention by the scientific community, mainly due to the appearance of collective excitations that behave as magnetic monopole like particles. In these systems, geometrical frustration induces the appearance of degenerated ground states characterized by a local energy minimization rule, the ice rule. Violations of this rule were shown to behave like magnetic monopoles connected by a string of dipoles that carries the magnetic flux from one monopole to the other. In order to obtain a deeper knowledge about the behavior of these excitations we study the thermodynamics of a kind of magnetic polymer formed by a chain of magnetic dipoles in a square lattice. This system is expected to capture the main properties of monopole-string excitations in the artificial square spin ice. It has been found recently that in this geometry the monopoles are confined, but the effective string tension is reduced by entropic effects. To obtain the thermodynamic properties of the strings we have exactly enumerated all possible string configurations of a given length and used standard statistical mechanics analysis to calculate thermodynamic quantities. We show that the low-temperature behavior is governed by strings that satisfy ice rules.

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