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Numerical simulation of self-dual U(1) lattice field theory with electric and magnetic matter

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We study a recently proposed formulation of U(1) lattice field theory with electric and magnetic matter based on the Villain formulation. This discretization allows for a duality that gives rise to relations between weak and strong coupling. We use a worldline version of the model to overcome the complex action problem and discuss suitable algorithms for its simulation. We investigate the self-dual point and study the possibility of a spontaneous breaking of self duality.

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