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A Phenomenological Theory for the Z_2 Spin-Liquid Phase of the $S = 1/2$ Kagome Heisenberg Antiferromagnet

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The spin-1/2 kagome Heisenberg antiferromagnet is one of the most promising candidate systems for a quantum spin liquid. However, the precise nature of its ground state is still being debated. Recent density-matrix renormalization group (DMRG) calculations show evidence for a possible Z_2 spin-liquid phase, the effective description of which is a Z_2 gauge theory [1,2]. In this work, we construct a minimal Z_2 gauge Hamiltonian encapsulating the DMRG phenomenology in the $S = 0$ sector. We generalize Misguich's Hamiltonian [3] by including dynamical visons [4]. We show that our minimal model naturally produces the diamond resonance pattern observed in DMRG. Moreover, puzzling even-odd effects in kagome cylinders are easily explained by our model. We also predict the existence of edge spinons in certain cylindrical geometries.

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