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Universal Renyi mutual information in classical systems: the case of kagome ice[1] ARMIN RAHMANI, GIA-WEI CHERN, Los Alamos Natl Lab — We study the Renyi mutual information of classical systems characterized by a transfer matrix. We first establish a general relationship between the Renyi mutual information of such classical mixtures of configuration states, and the Renyi entropy of a corresponding Rokhsar-Kivelson–type quantum superposition. We then focus on chiral and nonchiral kagome-ice systems, classical spin liquids on the kagome lattice, which respectively have critical and short-range correlations. Through a mapping of the chiral kagome ice to the quantum Liftshitz critical field theory, we predict a universal subleading term in the Renyi mutual information of this classical spin liquid, which can be realized in the pyrochlore spin ice in a magnetic field. We verify our prediction with direct numerical transfer-matrix computations, and further demonstrate that the nonchiral kagome ice (and the corresponding quantum Rokhsar-Kivelson superposition) is a topologically trivial phase. Finally, we argue that the universal term in the mutual information of the chiral kagome ice is fragile against the presence of defects.

[1]LANL LDRD program

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