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## Quantum effects on unconventional pinch-point singularities from pseudo-fermion functional renormalization

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The discovery of emergent gauge theories in condensed matter systems is associated with novel phenomena such as fractionalization and topological excitations. A prime example are spin ice compounds, which are materials hosting a ground state described by an emergent  $U(1)$  gauge theory, featuring monopole excitations arising from the fractionalization of microscopic spin degrees of freedom. Remarkably, signatures of the gauge structure are visible in neutron scattering measurements as pinch-point singularities. Recently, classical spin liquids on the pyrochlore lattice have been proposed with a higher-rank gauge structure, where instead of a conventional gauge field the low-energy physics is described by fluctuations of a tensor field with a continuous gauge freedom. The corresponding classical correlations show variations of the conventional pinch-point singularities, such as pinch-lines or multi-fold pinch-points. Here, we investigate the effect of quantum fluctuations on these signatures using a state-of-the-art implementation of the pseudo-fermion functional renormalization group approach. We observe a significant modification of the signal drastically different from the simple broadening due to thermal fluctuations, highlighting the importance of quantum fluctuations in possible material realizations and interpretation of experimental observations.

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