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Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Festkörperforschung
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Hybrid

Login data will be announced by e-mail and on the colloquium webpage.

Dienstag, 8. Juli 2025	16.15 Uhr	Lecture Hall 2D5

Max-Planck-Institut für Festkörperforschung, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

The Enigmatic Dirac Quantum Spin Liquid

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Abstract

Quantum fluctuations can inhibit long-range ordering in frustrated magnets and potentially lead to quantum spin liquid (QSL) phases. A prime example is the gapless Dirac quantum spin liquid (DSL) with an emergent U(1) gauge field, which can be described at low energies in terms of emergent quantum electrodynamics in 2+1 dimension (QED3). Despite the availability of several promising triangular lattice candidate materials and recent advances in numerical methods the description of their dynamical response is an outstanding challenge. In this talk, I will first give a pedagogical introduction to the Dirac QSL and show how to obtain QED3 from a spin 1/2 model on the triangular lattice. Second, I will explain our recent theory for the dynamical spin structure factor of the triangular lattice J1-J2 Heisenberg model. We not only find good agreement between recent experiments and rigorous numerics but argue that our theory is a powerful tool for understanding the response of other types of QSLs and their instabilities.