



IFMP Seminar

Date Monday, December 16, 2024, at 14:50

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Zoom: 688 4227 2214, Passcode: IFMP2024-5

Speaker **Rico Pohle**

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Title **Numerical simulations of spin liquids and spin nematics in spin-1 magnets**

Abstract Spin-1 magnets allow for dipolar and quadrupolar moments on a single site, leading to rich physical properties as seen in spin nematic phases [1], Fe-based superconductors [2] and cold-atom systems [3]. However, probing these unconventional phases experimentally remains challenging, and therefore requires new theoretical tools to describe and interpret their ground state and excitation properties.

In this talk, we present a new Monte Carlo and molecular dynamics method designed for SU(3) coherent states, which can be used to study thermodynamic and dynamic properties of spin-1 magnets [4]. We benchmark this method by studying the ferroquadrupolar phase of the spin-1 bilinear-biquadratic (BBQ) model on the triangular lattice, and show excellent agreement with analytical flavour-wave theory and low-temperature expansion results. Additionally, we demonstrate the advantage of our approach through real-time dynamics simulations of topological defects in a spin nematic [5] and reveal a novel Z2 classical chiral spin liquid in the spin-1 Kitaev model with BBQ interactions [6-8].

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[3] E. Demler and F. Zhou, Phys. Rev. Lett. **88**, 163001 (2002).

[4] K. Remund, R. Pohle, Y. Akagi, J. Romhányi, and N. Shannon, Phys. Rev. Research **4**, 033106 (2022).

[5] L. Chojnacki, R. Pohle, H. Yan, Y. Akagi, N. Shannon, Phys. Rev. B **109**, L220407 (2024).

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[8] H. Yan, R. Pohle, [arXiv:2409.04061](https://arxiv.org/abs/2409.04061).

Host: M. Doerr