Discovery of BKT correlations in the quantum kagome compound $Cs_2Cu_3SnF_{12}$

Mihael S. Grbić
University of Zagreb, Faculty of Science, Department of Physics, Zagreb, Croatia
mgrbic.phy@pmf.hr

Frustrated quantum magnets, such as the spin S = 1/2 triangular-lattice and the kagome-lattice Heisenberg antiferromagnets, have been extensively studied because a large degeneracy of their ground state and low-dimensional enhancement of quantum fluctuations allow new phenomena to emerge. However, these same features also hinder the experimental determination of the exact nature of the ground state, particularly when single crystals are unavailable. Despite these difficulties, significant progress has been achieved, and various quantum spin liquids, chiral orders and fractionalized excitations have been reported. Surprisingly, notwithstanding the large body of work on two-dimensional (2D) systems, only a single report to date has identified 2D XY correlations of Berezinskii-Kosterlitz-Thouless (BKT) type in a frustrated lattice.

We investigate the microscopic properties of the kagome compound $Cs_2Cu_3SnF_{12}$ using ^{63,65}Cu nuclear quadrupolar resonance (NQR) in single crystal samples. Analysis of the local hyperfine fields below the Néel temperature T_N = 20 K indicates a spin structure consistent with $P2_1/n$ symmetry of negative vector chirality. Measurements of the spin–lattice relaxation rate T_1^{-1} reveal signatures of a gapless ground state and two-dimensional BKT–type correlations above T_N, extending over a broad temperature range of approximately 130 K in zero magnetic field [1]. Within the same temperature range, the observed increase in the NQR linewidth is consistent with short-range chiral order recently identified by neutron scattering. Our results establish $Cs_2Cu_3SnF_{12}$ as a unique quantum kagome system exhibiting BKT behavior.

References:
[1] M. S. Grbić, I. Jakovac, I. Kupčić, H. Tanaka, M. Horvatić, arXiv:2603.22481