Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Physical realization of a quantum spin liquid based on a complex frustration mechanism JOHANNES REUTHER, Helmholtz-Zentrum Berlin fuer Materialien und Energie, Berlin, Germany and Freie Universitaet Berlin, Germany, CHRISTIAN BALZ, BELLA LAKE, Helmholtz-Zentrum Berlin fuer Materialien und Energie, Berlin, Germany and Technische Universitaet Berlin, Germany — Unlike conventional magnets where the spins undergo magnetic long-range order in the ground state, in a quantum spin liquid they remain disordered down to the lowest temperatures without breaking local symmetries. Here, we investigate the novel, unexplored bilayer-kagome magnet $Ca_{10}Cr_7O_{28}$, which has a complex Hamiltonian consisting of isotropic antiferromagnetic and ferromagnetic interactions where the ferromagnetic couplings are the dominant ones. We show both experimentally and theoretically that this compound displays all the features expected of a quantum spin liquid. In particular, experiments rule out static magnetic order down to 19mK and reveal a diffuse spinon-like excitation spectrum. Numerically simulating this material using the pseudo fermion functional renormalization group (PFFRG) method, we theoretically confirm the non-magnetic ground state of the system and qualitatively reproduce the measured spin correlation profile. By tuning the model parameters away from those realized in $Ca_{10}Cr_7O_{28}$ we further show that the spin-liquid phase is of remarkable stability.

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Date submitted: 20 Nov 2016 Electronic form version 1.4