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(G*) The case for a U(1)π Quantum Spin Liquid Ground State in the Dipole-Octupole Pyrochlore Ce2Zr2O7

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The Ce3+ pseudospin-½ degrees of freedom in the pyrochlore magnet Ce2Zr2O7 are known to possess dipole-octupole character, making it a candidate for novel quantum spin liquid ground states at low temperatures. We've measured the heat capacity of Ce2Zr2O7 and fit the result to a quantum numerical linked cluster (NLC) calculation that allows estimates for the terms in the near-neighbour XYZ Hamiltonian expected for such dipole-octupole pyrochlore systems. Fits of the same theory to the temperature dependence of the magnetic susceptibility and unpolarized neutron scattering complement this analysis to produce robust estimates of the near-neighbour exchange parameters. A comparison between the resulting best fit NLC calculation and new polarized neutron diffraction results shows agreement, as well as discrepancies which are attributed to interactions beyond near-neighbours, such as zone-boundary diffuse scattering in the non-spin flip channel. We conclude that Ce2Zr2O7 realizes a U(1)π quantum spin liquid state at low temperatures, and one that resides near the boundary between dipolar and octupolar character.

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