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Effective Hamiltonian and dynamics of the dipole-octupole pyrochlore Ce2Zr2O7[1] ANISH BHARDWAJ, FSU, NHMFL, FL, USA, SHU ZHANG, UCLA, CA, USA, HAN YAN, Rice University, TX, USA, RODERICH MOESSNER, Max-Planck Institute for the Physics of Complex Systems, Dresden, Germany, ANDRIY H. NEVIDOMSKYY, Rice University, TX, USA, HITESH J. CHANGLANI, FSU, NHMFL, FL, USA — We study the pyrochlore magnet Ce2Zr2O7 which has been recently shown to exhibit strong signatures of quantum spin liquid behavior in neutron scattering experiments. Its magnetic properties emerge from interacting Ce3+ ions, each of which is in a ground state doublet with J=5/2,mJ= +/-3/2, that arises from strong spin orbit coupling and crystal field effects. The effective description is in terms of dipolar and octupolar spin 1/2 degrees of freedom, however the Hamiltonian parameters remain unknown. We solve this problem with a combination of finite temperature Lanczos and the self consistent Gaussian approximation to explain all measured magnetization and specific heat curves in addition to the static spin structure factor. Using classical Monte Carlo and Landau-Lifshitz dynamics we find that our Hamiltonian reproduces all prominent features in the dynamical spin structure factor. We use it to make predictions in an applied magnetic field and explain the important role played by octupoles in the disappearance of spectral weight.

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