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Evolution of Spinons with Magnetic Field in the One-Dimensional Heavy Fermion Yb_2Pt_2Pb[1] W.J. GANNON, L. WU, Stony Brook University, USA, I.A. ZALIZNYAK, Brookhaven National Laboratory, USA, F. DEMMEL, Rutherford Appleton Laboratory, UK, M.C. ARONSON, Stony Brook University and Brookhaven National Laboratory, USA — The antiferromagnetic (AF) metal Yb_2Pt_2Pb has a layered crystal structure, with Yb ions arranged in chains along the *c*-axis, while pairs of chains form orthogonal dimers in the tetragonal *a*-*b* plane, an in-plane structure that is topologically equivalent to the Shastry-Sutherland lattice (SSL). In zero magnetic field, 70% of the magnetic spectral weight is static, consisting of AF Bragg peaks corresponding to moments that order at $T_N = 2.07$ K, while fluctuations of the Yb moments, present even at T=0 are responsible for the remaining 30%. The low energy magnetic excitation spectrum observed in neutron scattering experiments is unambiguously one-dimensional, consisting exclusively of gapped, Heisenberg-like spinons that disperse along the Yb chain direction, while remaining dispersionless in the SSL layers. As field is increased, the static magnetic order is suppressed and a rapidly evolving set of longitudinal modes with dispersions both parallel and perpendicular to the Yb chains is observed, until the Yb moments are fully polarized at fields above 2.3 T. This places Yb_2Pt_2Pb very near but on the ordered side of the quantum critical point that links quantum mechanical Heisenberg and classical Ising physics in one dimension.

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