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Quantum freezing and re-entrant melting in a quantum spin liquid COLLIN BROHOLM[1], Johns Hopkins University, Baltimore, MD 21210, MATTHEW STONE, Condensed Matter Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, IGOR ZALIZNYAK, Brookhaven National Laboratory, Upton, NY 11973, DANIEL REICH, Johns Hopkins University, Baltimore, MD 21210, PETER VORDERWISCH, Hahn-Meitner Institut, D-14109 Berlin, Germany, NEIL HARRISON, National High Magnetic Field Laboratory, Los Alamos, NM 87545 — Exchange interactions in piperazinium hexachlorodicuprate (PHCC) produce a frustrated bilayer antiferromagnet. We report the field-temperature phase diagram of this system as determined via high field (up to H = 50 T) susceptibility and neutron scattering (H = 14.2 T) experiments. There are two quantum critical points: Hc1=7.6 T separates the singlet phase from a three dimensional spin-ordered state while Hc2=37 T marks the onset of saturated ferromagnetism. The long range ordered phase is embedded in a gapless quasi-two dimensional paramagnetic regime with short range spin correlations. Close to the low field quantum critical point, a reentrant phase transition between long range order and the singlet phase indicates that weak interactions with lattice or nuclear spin degrees of freedom become important.

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