Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Evolving Magnetism from self-damage in PuAm alloys S.K. MCCALL, M.J. FLUSS, B.W. CHUNG, M.W. MCELFRESH, G.F. CHAPLINE, Lawrence Livermore National Laboratory, R.G. HAIRE, Oak Ridge National Laboratory — As a consequence of the unusual nature of plutonium's electronic structure, point- and extended-defects exhibit extraordinary properties. Low temperature magnetic susceptibility measurements on Pu and PuAm show that the magnetic susceptibility increases as a function of time, yet upon annealing the specimen returns to its initial value. This excess magnetic susceptibility arises from the α-decay and U recoil damage cascades which produce vacancy and interstitials as point and extended defects and at low temperatures exceeds 10% of the annealed value after about 1 month of damage accumulation. Isochronal annealing measurements of α-Pu and stabilized δ-Pu reveal that the damage is frozen in place below $\sim$30K and completely annealed away above 300K. The binary PuAm alloy follows a similar trend, but after warming to temperatures between 35 and 50K where defects are expected to begin moving, an enormous Curie like magnetic susceptibility arises with a Curie constant approximating 1 μ_B/actinide atom. This large effective moment disappears after 60K as further annealing takes place. Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

Scott McCall
Lawrence Livermore National Laboratory

Date submitted: 16 Nov 2006 Electronic form version 1.4