Abstract Submitted
for the NWS15 Meeting of
The American Physical Society

Unusual thermal behavior in uranium dioxide KRZYSZTOF GOFRYK, Idaho National Laboratory, MARCELO JAIME, DAVID ANDERSSON, JASON LASHLEY, CHRIS STANEK, Los Alamos National Laboratory — Since their discovery more than two hundred years ago, the actinides have defied efforts of solid-state physicists to understand their unusual properties. These materials are among the most complex of the long-lived elements, and, in the solid state they display some of the most unusual behaviors of any series on the Periodic Table. A perfect example is uranium dioxide (UO_2). It is by far the most studied actinide material as it is a primary fuel used in light water nuclear reactors. Although UO_2 is best known as an engineering material, its properties indicate rare interactions between charge, spin and lattice, reminiscent of emergent phenomena. In particular, it is unclear how different degrees of freedom and quasiparticle excitations interact and what is the relationship to the thermal behavior. We report our new experimental and theoretical studies on uranium dioxide single crystals. Our results indicate that strong spin-lattice coupling and resonant scattering are important for understanding the general thermal behavior in this material. We will discuss implications of these results.

Krzysztof Gofryk
Idaho National Laboratory

Date submitted: 09 Apr 2015 Electronic form version 1.4