Abstract Submitted for the MAR11 Meeting of The American Physical Society

Measurements of charge localization effects in uranium and plutonium intermetallic compounds from  $L_{\rm III}$  X-ray absorption spectroscopy YU JIANG, C.H. BOOTH, Lawrence Berkeley National Laboratory, E.D. BAUER, J.N. MITCHELL, P.H. TOBASH, J.D. THOMPSON, J.L. SARRAO, Los Alamos National Laboratory, M.A. WALL, P.G. ALLEN, Lawrence Livermore National Laboratory, D. NORDLUND, Stanford Synchrotron Radiation Lightsource — At the heart of the complex behavior of 5f-electrons in uranium and plutonium is the variable localization of the 5f orbital. Plutonium, in particular, can behave like a localized lanthanide system or a delocalized transition-metal system, depending on its coordination environment. This behavior gives rise to a variety of novel physical properties in U and Pu compounds: unexpected magnetic susceptibilities, non-Fermi-liquid behavior, superconductivity, etc. To understand the dual nature of U and Pu 5f orbitals, we report measurements of the actinide  $L_{\rm III}$ -edge X-ray absorption spectra, including high-resolution partial fluorescence yield measurements, for a wide variety of intermetallics, including  $\alpha$ -U, UCoGa<sub>5</sub>, UCd<sub>11</sub>,  $\alpha$ - and  $\delta$ -Pu,  $PuCoGa_5$ , and  $PuCoIn_5$ . A systematic shift of the  $L_{III}$ -edge energy is observed, and is correlated to the Sommerfeld coefficient from heat capacity measurements. Based on these results, we argue that this type of experiment is a direct measure of the degree of 5f orbital localization for U and Pu.

> Corwin Booth Lawrence Berkeley National Laboratory

Date submitted: 06 Jan 2011

Electronic form version 1.4