

Abstract Submitted
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The Pressure Dependence of the Unscreened 4f Magnetic Moments of the Early Light Lanthanides DEVON MORTENSEN, University of Washington, MAGNUS LIPP, JOSEPH BRADLEY, Lawrence Livermore National Laboratory, PAUL CHOW, YUMING XIAO, Carnegie Institution of Washington, GERALD SEIDLER, University of Washington, WILLIAM EVANS, Lawrence Livermore National Laboratory — Using the satellite structure of the $L\gamma_1$ line in non-resonant x-ray emission spectra, we probe the high-pressure evolution of the bare 4f moments of the early light lanthanides at ambient temperature. For Ce and Pr this satellite peak experiences a sudden reduction concurrent with their respective volume collapse transitions. The partial persistence of this feature ($\sim 75\%$ for Ce and 60% for Pr) indicates a complementary persistence in moment, arguing qualitatively in favor of the Kondo volume collapse model. Conversely, we find that Nd exhibits an unexpected increase in bare 4f moment that is independent of any reported structural or delocalization transition. All of these results differ sharply from prior state-of-the-art dynamical mean field theory calculations. These measurements emphasize the importance of studying microscopic observables, rather than macroscopic thermodynamic susceptibilities (e.g., the equation of state), to obtain the most discerning test of the underlying, fundamental f-electron phenomenon at high pressures.

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