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Long range order and two-fluid behavior in heavy electron materials NICHOLAS CURRO, ABIGAIL SHOCKLEY, KENT SHIRER, ADAM DIOGUARDI, NICHOLAS ABROBERTS-WARREN, JOHN CROCKER, CHING LIN, DAVID NISSON, University of California at Davis — The heavy electron Kondo liquid is an emergent state of condensed matter that displays universal behavior independent of material details. Properties of the heavy electron liquid are best probed by NMR Knight shift measurements, which provide a direct measure of the behavior of the heavy electron liquid that emerges below the Kondo lattice coherence temperature as the lattice of local moments hybridizes with the background conduction electrons. Because the transfer of spectral weight between the localized and itinerant electronic degrees of freedom is gradual, the Kondo liquid typically coexists with the local moment component until the material orders at low temperatures. The two-fluid formula captures this behavior in a broad range of materials in the paramagnetic state. In order to investigate two-fluid behavior and the onset and physical origin of different long range ordered ground states in heavy electron materials, we have extended Knight shift measurements to URu_2Si_2, $CeIrIn_5$ and $CeRhIn_5$. Our results indicate that the ordered state can emerge from either the Kondo liquid or heavy electron component, and imply that the nature of the ground state is strongly coupled with the hybridization in the Kondo lattice.

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