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Spatial structure of entanglement in a system near a Kondo destruction quantum critical point[1] CHRIS WAGNER, TATHAGATA CHOWDHURRY, KEVIN INGERSENT, Univ of Florida - Gainesville, JEDEDIAH PIXLEY, Univ of Maryland — We use entanglement entropy as a probe of the ground state of the pseudogap Kondo model near a quantum critical point (QCP) that separates a Kondo-screened phase (reached for impurity-band exchange couplings $J > J_c$) from a Kondo-destroyed or local-moment phase ($J < J_c$). The impurity contribution to the entanglement entropy between a region of radius R around the magnetic impurity and the rest of the semimetallic host reveals a characteristic length scale R^* that distinguishes a regime $R \ll R^*$ of maximal critical entanglement from one $R \gg R^*$ of weaker entanglement. In contrast to the conventional case of a metallic host, entanglement in the Kondo phase remains nonzero for $R \gg R^*$, suggesting that the Kondo screening cloud is infinite. In the local-moment phase, the strong entanglement for $R \ll R^*$ evidences a dynamical Kondo effect, but the entanglement decreases toward zero for $R \gg R^*$. Within each phase, the impurity entanglement entropy computed via the numerical renormalization group is well described as a universal function of R/R^*. The value of R^* diverges on approach to the QCP like $|J - J_c|^{-\nu}$, where ν is the correlation length exponent, leading to maximal entanglement extending throughout the entire system.

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