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The Knight shift anomaly in the disordered periodic Anderson model
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TAR, UC Davis — In some materials, the coherence temperature $T^*$ signals the
regime in which one has a heavy-electron fluid and ‘dissolved’ local moments. An
experimental signature of $T^*$ is provided by the Knight shift anomaly in NMR mea-
surements. Further, the contribution of the heavy-electron fluid to the Knight shift,
$K_{\text{HF}}$, displays universal character over a wide range of temperatures. An important
probe of the physical mechanisms at play is the random substitution of say, La for
Ce in CeRhIn$_5$: this amounts to removing local moments at random sites, and one
may wonder whether these universal features are sensitive to the presence of disor-
der. The Periodic Anderson Model (PAM) captures many aspects of heavy-fermion
materials, so here we consider the two-dimensional PAM with a fraction $x$ of the
f-sites removed at random. Through Determinant Quantum Monte Carlo simulations
we find that universality of $K_{\text{HF}}$ persists even in the presence of disorder, which, in
turn, allows us to establish that $T^*$ decreases monotonically with $x$, in agreement
with available experimental data. Our simulations also shed light into the low tem-
perature behavior of the disordered PAM at low temperatures: the spin liquid phase
of the local moments is suppressed upon dilution.