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Impurities near an Antiferromagnetic-Singlet Quantum Critical Point[1] TIAGO MENDES SANTOS, NATANAEL COSTA, THEREZA PAIVA, RAIMUNDO DOS SANTOS, UFRJ, GEORGE BATROUNI, University of Nice-Sophia Antipolis, NICHOLAS CURRO, RICHARD SCALETTAR, UC Davis — Heavy fermion systems, and other strongly correlated electron materials, often exhibit a competition between antiferromagnetic (AF) and singlet ground states. Using exact Quantum Monte Carlo (QMC) simulations, we examine the effect of impurities in the vicinity of such AF-singlet quantum critical points, through an appropriately defined "impurity susceptibility," $\chi_{\rm imp}$. Our key finding is a connection, within a single calculational framework, between AF domains induced on the singlet side of the transition, and the behavior of the nuclear magnetic resonance (NMR) relaxation rate $1/T_1$. We show that local NMR measurements provide a diagnostic for the location of the QCP which agrees remarkably well with the vanishing of the AF order parameter and large values of $\chi_{\rm imp}$. We will also discuss the temperature dependence of the linewidth of the NMR spectrum. We connect our results with experiments on Cd-doped $CeCoIn_5$.

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