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Neutron Scattering Studies of Hidden Order in URu₂Si₂¹

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The heavy fermion superconductor URu₂Si₂ has held the attention of physicists for the last two decades due to the presence of a mysterious hidden order phase below 17.5 K. Previous neutron scattering measurements indicate that the ordered moment is $0.03 \mu_B$, much too small to account for the large heat capacity anomaly at 17.5 K. We present recent neutron scattering experiments which unveil a new piece of this puzzle - the spin excitation spectrum above 17.5 K exhibits well-correlated, *itinerant*-like spin excitations up to at least 10 meV emanating from incommensurate wavevectors. The gapping of these excitations corresponds to a large entropy release and explains the reduction in the electronic specific heat through the transition. We also present new neutron scattering data linking the spin excitations to Fermi surface instabilities, and discuss the remaining candidates for the identity of the hidden order phase.

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