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Electronic structure model of the hidden order and Fermi surface gapping in URu_2Si_2 PETER OPPENEER, SAAD ELGAZZAR, JAN RUSZ, MICHI-TO SUZUKI, Uppsala University, JOHN MYDOSH, University of Cologne
— The hidden order (HO) in the heavy-fermion superconductor URu_2Si_2 has been studied for more than 20 years, without that the nature of this unusual phase could be uncovered. We present a microscopic explanation for the mechanism of the hidden order, on the basis of state-of-the-art electronic structure calculations. In particular, we show that our calculations explain very well all the known properties of the paramagnetic and large moment antiferromagnetic (LMAF) phases. Exploiting the known experimental equivalence between the Fermi surface properties of the LMAF and HO phases, we identify the Fermi surface "hot spots" where a Fermi surface instability is lifted through spontaneous symmetry breaking, causing a surprisingly large Fermi surface gapping. We quantify that symmetry breaking through collective modes of antiferromagnetic moment excitations can induce a substantial Fermi surface gapping that consistently explains the transport properties and entropy loss of the HO phase.

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