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Hidden Order Transition in URu_2Si_2: Evidence for the Emergence of a Coherent Anderson Lattice from Scanning Tunneling Spectroscopy JEREMY FIGGINS, TING YUAN, DIRK MORR, University of Illinois at Chicago — The heavy-fermion compound URu_2Si_2 exhibits an onset of Kondo screening around T $\approx$ 55K and undergoes a second order phase transition at $T_0 = 17.5$K into a state with a still unknown hidden order parameter. Recent scanning tunneling spectroscopy experiments have provided insight into the temperature evolution of the electronic structure. Above the hidden order transition, the differential conductance, dI/dV, exhibits a characteristic Fano lineshape. In contrast, below T_0, a soft gap opens up in dI/dV and a quasi-particle interference (QPI) analysis reveals a band structure similar to that expected in a screened Kondo lattice. We demonstrate that the experimental dI/dV and QPI results below T_0 are consistent with the formation of a coherent Anderson lattice (CAL). In particular, dI/dV exhibits characteristic signatures of the Anderson lattice band structure, such as an asymmetric gap and a peak inside the gap which arises from the van Hove singularity of the heavy f-electron band. We identify several branches of the QPI pattern arising from intra- and interband scattering. Finally, the temperature evolution of dI/dV suggests that the formation of the CAL below the HOT is primarily driven by a strong increase of the lifetime of the heavy quasi-particles.

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