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Heavy d-Electron Quasiparticle Interference and Real-space Electronic Structure of $Sr_3Ru_2O_7$ JINHO LEE, Brookhaven National Laboratory, Cornell University, University of St. Andrews, M. P. ALLAN, University of St. Andrews, Cornell University, M. A. WANG, Cornell University, J. E. FARRELL, S. A. GRIGERA, F. BAUMBERGER, University of St. Andrews, J. C. DAVIS, Cornell University, Brookhaven National Laboratory, University of St. Andrews, A. P. MACKENZIE, University of St. Andrews — The intriguing idea that strongly interacting electrons can generate electronic liquid crystalline phases is already a decade old, but these systems still represent an unexplored frontier of condensed matter physics. One reason is that visualization of the many-body quantum states generated by the strong interactions, and of the resulting nematic electronic phases, has not been achieved. $Sr_3Ru_2O_7$ possesses (i) a very strongly renormalized "heavy" d-electron Fermi liquid , and (ii) exhibits a field-induced transition to an electronic nematic phase. We present the first observation of scattering interference of heavy d-electron quasiparticles at individual Ti dopant atoms substituted in $Sr_3(Ru_{1-x}Ti_x)_2O_7$, and the associated discovery that it derives from a band formed from the Ru d_{xz}, d_{yz} orbitals recently postulated to be behind the formation of the nematic state. Simultaneously, we achieve direct sub-atomic imaging of r-space electronic structure which can be associated with these same d-orbitals within the many-body state.

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