

Abstract Submitted
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Direct measurement of the localized - itinerant transition, hybridization and spin density waves transition of 5f electrons.¹ SHI-YONG TAN, DONG-HUA XIE, XIN-CHUN LAI, China Acad of Engr Phys — In heavy-fermion compounds, f electrons show both itinerant and localized behavior depending on the external conditions, and the hybridization between localized f electrons and itinerant conduction bands gives rise to their exotic properties like heavy-fermions, magnetic orders and unconventional superconductivity. Due to the risk of handling radioactive actinide materials, the direct experimental evidence of the band structure evolution across the localized to itinerant and magnetic transition for 5f electrons is lacking. Here, by using angle-resolved photoelectron spectroscopy, we revealed the dual nature (localized vs itinerant) and the development of two kinds of heavy quasi-particles bands of 5f electrons in antiferromagnetic USb₂. Partially opened energy gaps were observed on one quasi-particle 5f band cross the AFM transition around 203K, indicating that the magnetic orders in USb₂ are of spin density waves (SDW) type similar to Cr. The localized 5f electrons and itinerant conduction bands hybridize to form another heavy quasi-particles band at around 120K, and then open hybridization gaps at even lower temperature. Our results provide direct spectral demonstration of the localized -itinerant transition, hybridization and SDW transition of 5f electrons for uranium-based materials.

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