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Visualizing the impact of valence fluctuation in the momentum space in a mixed valence system SHOUVIK CHATTERJEE, JACOB RUF, HAOFEI WEI, KENNETH FINKELSTEIN, DARRELL SCHLOM, KYLE SHEN, Cornell University — In mixed valence systems, impact of valence fluctuation on the low-energy band structure and Fermi surface topology is of fundamental importance to gain understanding of their emergent properties and inherent k-space susceptibilities, but has remained enigmatic due to a lack of appropriate experimental probes. Here, we employ molecular-beam epitaxy (MBE) to synthesize epitaxial thin films of the prototypical mixed valence system YbAl3 and utilize in situ high-resolution angle-resolved photoemission spectroscopy (ARPES) to directly visualize the evolution of its low-energy band structure while tracking the change in Yb valence as temperature is varied. Our measurements reveal a dramatic temperature dependent shift in chemical potential leading to a Lifshitz transition of a small electron Fermi surface that exactly matches the change in Yb valence determined from core level spectroscopy without any scaling factor. I will describe a unified picture of how local valence fluctuations connect to momentum-space concepts such as band filling and Fermi surface topology in the classic problem of mixed valence systems.

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