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Camelback-shaped band reconciles heavy-electron behavior with weak electronic Coulomb correlations in superconducting $TlNi_2Se_2$ CHRISTIAN MATT, NAN XU, Swiss Light Source, Paul Scherrer Insitut, CH-5232 Villigen PSI, Switzerland, A. VAN ROEKEGHEM, S. BIERMANN, Ecole Polytechnique, CNRS-UMR7644, 91128 Palaiseau, France, P. RICHARD, X. SHI, S.-F. WU, H. W. LIU, D. CHEN, T. QIAN, H. DING, Beijing National Laboratory for Condensed Matter Physics and Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China, H. WANG, Q. MAO, J. DU, M. FANG, Department of Physics, Zhejiang University, Hangzhou 310027, China, N. PLUMB, M. RADOVIC, J. MESOT, M. SHI, Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland — Combining photoemission spectroscopy, Raman spectroscopy, and first-principles calculations, we characterize superconducting TlNi₂Se₂ as a material with weak electronic Coulomb correlations leading to a bandwidth renormalization of 1.4. We identify a camelback-shaped band, whose energetic position strongly depends on the selenium height. While this feature is universal in transition metal pnictides, in $TlNi_2Se_2$ it lies in the immediate vicinity of the Fermi level, giving rise to a pronounced van Hove singularity (VHS). The resulting heavy band mass resolves the apparent puzzle of a large normal-state Sommerfeld coefficient in this weakly correlated compound. The correlation effect evolution in pnictides upon d-shell filling in the presence of significant Hund's exchange coupling will also be discussed.

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