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Layered Kondo lattice model for quantum critical superconductor β-$YbAlB_4$ ANDRIY NEVIDOMSKYY, PIERS COLEMAN, Rutgers University — We perform a theoretical analysis of the magnetic and electronic properties of the quantum critical heavy fermion superconductor β-$YbAlB_4$. Using a combination of the realistic material modelling and single-ion crystal field analysis, we propose a layered Kondo lattice model for this system, in which two dimensional boron layers are Kondo-coupled via interlayer Yb moments in a $J_z = \pm 5/2$ state. This model fits the measured single ion magnetic susceptibility and predicts a substantial change in the electronic anisotropy as the system is pressure-tuned through the quantum critical point. An interesting connection is made between this model and the Kondo effect in Coulomb-blockaded quantum dots. We also calculate the Fermi surface and the angular dependence of the extremal orbits relevant to the de Haas–van Alphen measurements.

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