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$\beta - YbAlB_4$: a critical vortex metal[1] ALINE RAMIRES, PIERS COLEMAN, Rutgers University, ALEXEI TSVELIK, Brookhaven National Laboratory — $\beta - YbAlB_4$ is the first Yb based heavy fermion superconductor and has a non Fermi Liquid behavior in the normal state that develops without external tuning by pressure or doping, making it intrinsically quantum critical [1]. Application of a magnetic field is found to drive the development of a Fermi Liquid in which the Fermi temperature is determined by the Zeeman energy [2]. Here we present a theory for the intrinsic quantum criticality in which the main ingredient is an anisotropic hybridization matrix with line nodes in momentum space that carry a vorticity and resemble topological defects. Our theory predicts that the application of a field induces a novel Lifshitz transition, in which a quasi-two dimensional Fermi Liquid with density of states $N^*(B) \propto 1/\sqrt{B}$ nucleates around the line node in momentum space. We also discuss how the vortex metal picture can account for the ESR anomalies observed in this system [3].

[1] S. Nakatsuji *et al.*, Nature Phys. 4, 603 (2008). [2] Y. Matsumoto *et al.*, Science 21, 316 (2011). [3] L. M. Holanda *et al.*, Phys Rev. Lett. 107, 026402 (2011).

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