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Pnictide Half-Dirac Nodal Quasiparticle Scaling Properties in Vortex State IMAM MAKHFUDZ, Johns Hopkins University — We investigate the scaling properties of quasiparticles of Pnictide with "half-Dirac" node under magnetic field in vortex state. By computing the density of states, we aim to find in vortex state the form of non-Simon-Lee scaling predicted for such system by several recent works in non-vortex state. We find by exact diagonalization of the BdG Hamiltonian and finite size scaling a $N(E) \sim \sqrt{E}$ power law in the case without magnetic field which agrees with analytical prediction. We consider the vortex state by first studying the hypothetical situation of uniform magnetic field without vortices and then we properly treat the magnetic field-induced vortex lattice by expressing the BdG Hamiltonian in terms of superfluid velocity and Berry's gauge field. The two calculations are shown to agree with each other. We then analyze quantitatively, the effects of anisotropic dispersion to the quasiparticles scaling properties in vortices. A very crucial prediction is also made on an upper bound to the value of "anomalous dimension" δ of density of states scaling with magnetic field, a quantity that can be measured experimentally.

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