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Trapped fermions in a synthetic non-Abelian gauge field[1] SUDEEP KUAMAR GHOSH, JAYANTHA P. VYASANAKERE, VIJAY B. SHENOY, Indian Institute of Science Bangalore — On increasing the coupling strength (λ) of a non-Abelian gauge field that induces a generalized Rashba spin-orbit coupling, the topology of the Fermi surface of a homogeneous gas of non-interacting fermions of density $\rho \sim k_F^3$ undergoes a change at a critical value, $\lambda_T \approx k_F$ [PRB **84**, 014512 (2011)]. We analyze how this affects the size/shape of a cloud of fermions trapped in a harmonic potential. We develop an adiabatic formulation, with Pancharatnam-Berry phase terms, for the one particle states in a trap with the gauge field. Local density approximation reveals that the cloud shrinks in a *characteristic fashion with increasing* λ and predicts a spherical cloud for all gauge field configurations. We show, via a calculation of the cloud shape using exact eigenstates, that for certain gauge fields there is systematic anisotropy in the cloud shape that increases with increasing gauge coupling λ. An important spin-off of our adiabatic formulation is that it reveals exciting possibilities for the cold-atom realization of interesting Hamiltonians (eg. quantum hall spherical geometry) by using a non-Abelian gauge field in conjunction with another potential.

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