Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

How does a synthetic non-Abelian gauge field influence the bound states of two spin-1/2 fermions?[1] JAYANTHA VYASANAKERE, VIJAY SHENOY, Indian Institute of Science, Bangalore — We study the bound states of two spin-1/2 fermions interacting via a contact attraction (characterized by the scattering length) in the singlet channel in $3D$ space in presence of a uniform non-Abelian gauge field. The configuration of the gauge field that generates a Rashba type spin-orbit interaction is described by three coupling parameters $(\lambda_x, \lambda_y, \lambda_z)$. For a generic gauge field configuration, the critical scattering length required for the formation of a bound state is *negative*, i.e., shifts to the "BCS side" of the resonance. Interestingly, we find that there are special high-symmetry configurations (e.g., $\lambda_x = \lambda_y = \lambda_z$) for which there is a two body bound state for *any* scattering length however small and negative. Our results show that the BCS-BEC crossover is drastically affected by the presence of a non-Abelian gauge field. We discuss possible experimental signatures of our findings both at high and low temperatures.

[1]Work supported by DST, India through Ramanujan grant

Jayantha Vyasanakere
Indian Institute of Science Bangalore

Date submitted: 18 Nov 2010 Electronic form version 1.4