

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Colliding clouds of strongly interacting fermions and out-of-phase spin modes**<sup>1</sup> EDWARD TAYLOR, WILLIAM SCHNEIDER, SHIZHONG ZHANG, MOHIT RANDEIRA, The Ohio State University — Motivated by recent experiments at MIT, we consider the problem of what happens when two Fermi clouds prepared in different hyperfine states collide with each other at low velocities close to a Feshbach scattering resonance. Upon coming into contact with each other, we show that the two clouds evolve preferentially into a metastable upper branch (with amplitude given by the coherent quasiparticle residue  $Z$ ) where interactions are repulsive, and not the ground state lower branch. As a result, even though the underlying interaction between the fermions is attractive, for sufficiently strong interactions in the unitary region, the clouds will “bounce” off each other. Using Boltzmann, sum rule and hydrodynamic approaches, we make predictions for the frequency of the bounce mode on the BEC side of resonance, including unitarity, where the scattering length is positive.

<sup>1</sup>Supported by NSF-DMR 0706203, NSF-DMR 0907366, and ARO W911NF-08-1-0338

Edward Taylor  
The Ohio State University

Date submitted: 18 Nov 2010

Electronic form version 1.4