

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Superfluid Pairing and Majorana Zero Mode in an Ultracold Rydberg Fermi Gas BO XIONG, H.H. JEN, JHIH-SHIH YOU, DAW-WEI WANG, Physics Department National Tsing-Hua University, Hsinchu, Taiwan — We systematically calculate the p-wave superfluid phase of spin polarized Fermi gases in a Rydberg state. The mutual interaction between atoms are dressed by external fields and show nonlocal attractive $1/(a+r6)$ interaction. Different from the p-wave pairing phase of regular atoms near p-wave Feshbach resonance, the obtained p-wave superfluid phase can be stable away from three-body collision and has intrinsic non-trivial nodes in the momentum space. The critical temperature and order parameter for various interaction parameters have been calculated analytically and numerically, both in the 2D and 3D free space. When loading into optical lattice, we also show the proximity effect of T_c near half filling. Finally, when considering the harmonic confinement potential, we obtain the gapless Majorana Fermions confined to the boundary via self-consistently solving the DBG equation. We will discuss how to experimentally prepare and measure these Majorana states in Rydberg atoms.

Bo Xiong
Physics Department National Tsing-Hua University, Hsinchu, Taiwan

Date submitted: 12 Nov 2012

Electronic form version 1.4