Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Disorder effects in multiorbital $s_{\pm}$-wave superconductors: Implications for Zn-doped $BaFe_2As_2$ compounds[1] HUA CHEN, ZIMP, Zhejiang University, 310027, China, YUAN-YEN TAI, C.S. TING, Department of Physics and Texas Center for Superconductivity, University of Houston, Houston, Texas 77204, USA, MATTHIAS J. GRAF, Theoretical Division and Center for Nonlinear Studies, LANL, Los Alamos, New Mexico 87545, USA, JIANHUI DAI, Department of Physics, Hangzhou Normal University, 310036, China, JIAN-XIN ZHU, Theoretical Division and Center for Nonlinear Studies, LANL, Los Alamos, New Mexico 87545, USA — Recent experiments on Zn-doped 122-type iron pnictides, $Ba(Fe_{1-x-y}Co_yZn_x)_2As_2$, are challenging our understanding of electron doping the 122s and the interplay between doping and impurity scattering. To resolve this enigma, we investigate the disorder effects of nonmagnetic Zn impurities on various properties of the system in the $s_{\pm}$-wave pairing state. The BdG is solved based on a minimal two-orbital model with an extended range of impurity concentrations. With increasing Zn concentration the density of states shows a gradual filling of the gap, revealing pair breaking effect. Both the averaged superconducting order parameter and superfluid density are dramatically suppressed towards the dirty limit, indicating the violation of the Anderson theorem and breakdown of the AG theory for impurity-averaged Green's functions. The superconductivity is fully suppressed close to the critical impurity concentration of $n_{\rm imp} \approx 10\%$, in agreement with recent experiments.

[1]NSF No.11274084, Z6110033, PHYS-1066293, 973 No. 2010CB923000, RAWF No. E-1146, LANL LDRD, CIN, U.S. DOE

Hua Chen
ZIMP, Zhejiang University, Hangzhou 310027, China

Date submitted: 14 Nov 2013 Electronic form version 1.4