Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Multiband effect on the magnetic resonance spectrum of pnictide superconductors TANMOY DAS, A.V. BALATSKY, LANL — The magnetic resonance behavior which is directly probed by the inelastic neutron scattering (INS) spectroscopy gives valuable information about the pairing mechanism of the unconventional superconductors. In high-T_c cuprate superconductors, INS exhibits a clear signature of a magnetic resonance mode in addition to its characteristic dispersive feature (known as "hour-glass" behavior) which are enhanced dramatically below T_c and the mode energy scales universally with the SC gap amplitude. In a multiband unconventional superconductors, the situation is more complex due to the presence of multi-orbital band structure, multiple-SC gaps as well as possibilities of having multiple pairing symmetries. We calculate magnetic susceptibility to show how does the magnetic resonance mode and its dispersion evolve both in energy as well as in momentum as a function of doping in both electron and holed doped pnictide superconductors. The inputs in our calculations are the Fermi surface information from ARPES or LDA and experimental values of superconducting gaps. We find that the magnetic resonance behavior is dramatically different in pnictide than in cuprates. The effects of multiple orbitals, gaps and different pairing symmetry play an important role. We argue that doping dependence of the resonance spectra can be understood from the topological change of the Fermi surface and the gap magnitudes, in good accord with experiments.

Tanmoy Das
Los Alamos National Laboratory

Date submitted: 28 Dec 2010 Electronic form version 1.4