Thesis Outline

Ben Rosemeyer

August 26, 2014

Contents

1 Superconducting Order Parameter

-Self Consistentcy -DOS gap -Meisner effect/magnetic incompatibility of gapped DOS

2 Electron Magnetism

-As susceptibility -As part of Hamiltonian (TB)

3 $CeCoIn_5$

-phase diagram (T,H,P,Doping) -coexistence region -DOS near fermi level -movement of chemical potential with P/Doping -phase diagram of Kato et al

4 homogeneous susceptibility with field

-favored wave vectors -Behavior of prefered vectors with B -Phase diagram of sus. enhancement -comparison to experiment

5 actual Electron structure of $CeCoIn_5$

-Cornell paper on band dispersion -phase diagram using kato method with cornell dispersion -interband/within band magnetic interactions -3D effects

6 inhomogeneous (interfaces) superconductivity

-proximity effect -FFLO state -inhomogeneous susceptibility (equations) -self consistency (?) -superconductor/ferromagnet interfaces

7 S-wave near Normal interface

-enhanced susceptibility of SC for characteristic (position dependent) wave vectors -only within coherence length of interface -small q enhancements could be seen as ferromagnetic in experiments if confined to length $L << \pi/q$