MAR15-2014-020753

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Buckley Prize Talk: Electrostatic Control of the Superconductor-Insulator Transition[1]

ALLEN GOLDMAN, Univ of Minnesota - Minneapolis

The superconductor-insulator transitions (SITs) of ultra-thin films are among the simplest quantum phase transitions. The ground states of systems that have been studied are usually changed by adjusting the level of disorder, by the application of perpendicular and parallel magnetic fields, by altering the chemical composition, and by the seeding of the surface with pair-breaking magnetic impurities. More recently, realizations of the electric field effect have been used to tune SITs. This has been done with devices employing high dielectric constant gate insulators, as well as with electric double layer transistor devices employing ionic liquids as gate insulators. In addition to disordered ultrathin films, cuprates, and metallic interfaces between insulators have also been studied. The SITs of selected systems will be reviewed with particular attention being paid to the results of finite size scaling analyses of the transitions, and the nature of the insulating states found. In the case of the cuprates, the extent to which their phase diagrams can be traversed will be explored. Finally the potential value of electrostatic gating as a tool in the search for new superconductors will be discussed.

[1]This work was supported by the National Science Foundation under awards, DMR-0854752 and DMR-1263316, and by the University of Minnesota MRSEC under Award DMR-1420013.