Two component Coulomb glass in disordered superconducting films  

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International Center for Theoretical Physics — We propose a new two component  
Coulomb glass model which includes strong disorder, Coulomb interaction, and on-  
site electron pairing to investigate the effects of localized pairing in disordered films  
on the insulating side of a superconductor-insulator transition. In particular, we  
show how the density of states (DOS) changes with increasing on-site coupling  
between electrons, from an Efros-Shklovskii linear DOS for the electrons at weak  
coupling, to a strongly modified, non-monotonic DOS with nonuniversal Coulomb  
gap for electrons and on-site pairs at moderate coupling, and finally to an Efros-  
Shklovskii linear DOS for pairs at strong coupling. We discuss the effects of a  
spatially random coupling. We use a Miller Abrahams resistor network mapping  
to numerically calculate resistance for samples of this model, given temperature  
and localization length. With certain parameter choices, we can obtain a peak in  
resistance with respect to magnetic field, reminiscent of magnetoresistance peaks  
reported experimentally.