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Bose Metal in 2D[1]

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Bosons are thought to exist in two quite distinct ground states: 1) localized in a Mott insulator or 2) condensed in a superconductor. However, recent experiments point to a third intriguing possibility: a metal with a finite resistivity at zero temperature. The Bose metallic phase appears to be quite robust and is observed in a wide variety of thin films which should nominally exihibit only insulating or superconducting phases. I will review the standard theoretical framework used to understand the insulator-superconductor transition, the recent experimental results and I will show quite generally how bosons in the presence of disorder can form a metallic state. The metallic state is rather weird, however. The phase degrees of freedom are glassy and it is the low-lying degrees of freedom in the glassy state that mediate the metallic state. An explicit calculation reveals that the phase stiffness vanishes, thereby confirming that the state found here is distinct from a superconductor. The relevance to the vortex glass state of the cuprates in which recent experiments suggest a transition to such a state occurs without the vanishing of the linear resistivity will be discussed. Relevant papers: 1.) P. Phillips and D. Dalidovich, Science **302**, 243 (2003). 2.) P. Phillips and D. Dalidovich, Phys. Rev. B **68**, 104427 (2003). 3.) D. Dalidovich and P. Phillips, Phys. Rev. Lett. **89**, 27001 (2002).

[1]Work with Denis Dalidovich