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Magnetically Induced Superconductor-Metal-Insulator Transition in Thin Tantalum Films CARLOS VICENTE, YONGGUANG QIN, JONG-SOO YOON, University of Virginia — Homogeneously disordered superconducting thin tantalum films are found to exhibit a metallic behavior in the limit of zero temperature when the superconductivity is suppressed by weak magnetic fields. The metallic behavior is characterized by an apparent saturation of sample resistance to a finite value, which can be order of magnitude smaller than the normal state resistance. This implies that the metallic state exists as a separate phase rather than a point in phase diagram. Such a metallic behavior is in strong contrast to the traditional belief that the electronic state of a 2D superconducting film can either be superconducting or insulating. We present details of transport characteristics in the magnetically induced metallic and insulating phase. We also discuss the influence of disorder, represented by normal conducting sheet resistance, on the metallic behavior and the superconductor-metal-insulator phase transition.

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