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Insulating, Metallic, and Superconducting Transport regimes of 2D Amorphous Superconducting Films in B-T-Disorder Space YIZE LI, JONGSOO YOON, University of Virginia — Amorphous tantalum thin films are known to exhibit a superconductor-metal-insulator transition in the zero temperature limit with increasing magnetic fields. The metallic phase intervening the superconducting and insulating phase is unexpected. Each phase is known to exhibit unique nonlinear transport properties [1] with intrinsic origins [2]. In order to study how the mechanism behind each phase is influenced by B, T, and disorder, we have measured the evolution of nonlinear transport properties by changing B, T, and disorder. The resulting "phase diagram" of a sample with normal state sheet resistivity of 2.3 kilo-ohm indicates that the superconducting phase is completely surrounded by metallic phase, and a direct superconductor-insulator transition is not allowed. Recently, we extend our study on other samples with different disorder that is controlled by film thickness. By combining these results, we can map out the 3D phase diagram in B-T-disorder space. [1] Y.Qin et al., Phys. Rev. B 73, 100505(R) (2006). [2] Y. Seo et al., Phys. Rev. Lett. 97, 057005 (2006).

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