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Superconductor-Metal-Insulator transition in two dimensional Ta thin Films[1] SUN-GYU PARK, EUNSEONG KIM, Center for Supersolid and Quantum matter Research, Department of Physics, KAIST, Daejeon 305-701, Korea — Superconductor-insulator transition has been induced by tuning film thickness or magnetic field. Recent electrical transport measurements of MoGe, Bi, Ta thin films revealed an interesting intermediate metallic phase which intervened superconducting and insulating phases at certain range of magnetic field. Especially, Ta thin films show the characteristic IV behavior at each phase and the disorder tuned intermediate metallic phase [Y. Li, C. L. Vicente, and J. Yoon, Physical Review B 81, 020505 (2010)]. This unexpected metallic phase can be interpreted as a consequence of vortex motion or contribution of fermionic quasiparticles. In this presentation, we report the scaling behavior during the transitions in Ta thin film as well as the transport measurements in various phases. Critical exponents v and z are obtained in samples with wide ranges of disorder. These results reveal new universality class appears when disorder exceeds a critical value. Dynamical exponent z of Superconducting sample is found to be 1, which is consistent with theoretical prediction of unity. z in a metallic sample is suddenly increased to be approximately 2.5. This critical exponent is much larger than the value found in other system and theoretical prediction.

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