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Anomalous Insulating State Induced by Application of Parallel Magnetic Fields to 2D Superconducting Films KEVIN A. PARENDO, K. H. SARWA B. TAN, ALLEN M. GOLDMAN, School of Physics and Astronomy, University of Minnesota — Superconductor-insulator transitions in ultrathin films of amorphous Bi have been investigated by electrostatic electron doping, incrementing film thickness, and applying parallel magnetic fields. When superconductivity was induced in an insulating film by electrostatic tuning, a quantum phase transition was observed down to 60 mK. When superconductivity was quenched by parallel magnetic fields, above ~ 150 mK, R(T) was best described by 2D Mott variable range hopping at the highest fields and scaling was successful. However, an anomalous insulating state was induced by the field below ~ 150 mK in which the resistance becomes larger than expected from extrapolation of R(T) from higher temperatures, causing scaling to break down. This anomalous state has not been observed in zero field thickness- or electrostatic-tuned transitions in bismuth. It has also been observed in amorphous In_2O_3films in parallel fields, but not in perpendicular fields. This work is supported in part by the National Science Foundation under grant NSF/DMR-0455121.

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