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Superconductor-insulator transitions in films patterned with a disordered nanohoneycomb hole array

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Superconductor-insulator transitions in films patterned with a disordered nanohoneycomb hole array¹ H.Q. NGUYEN, S.M. HOLLEN, M.D. STEWART, JR., AIJUN YIN, J.M. SHAINLIN, J.M. XU, J.M. VALLES, JR., Brown University — On both sides of the Superconductor-Insulator Transition (SIT), ultrathin Bi films patterned with an ordered array of holes exhibit magnetoresistance (MR) oscillations with a period set by the superconducting flux quantum[1]. This observation implies that the insulating phase consists of localized Cooper pairs. To probe further this localized Cooper pair phase we have investigated samples patterned with disordered hole arrays. We have found that disorder reduces the number of MR oscillations and weakens the magnetic field tuned SIT. We will present these results and discuss their implications for the Cooper pair insulating phase.

[1] M.D Stewart, Jr., A. Yin, J.M. Xu, and J.M. Valles, Jr., *Science* **318**, 1273 (2007)

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