Cooper pair localization in a-Bi thin films near the superconductor-insulator transition

Shawna M. Hollen  
*University of New Hampshire - Main Campus*

H Q. Nguyen  
*Brown University*

E. Rudisaile  
*Brown University*

J Shainline  
*Brown University*

G. E. Fernandes  
*Brown University*

*See next page for additional authors*

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Authors

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Cooper pair localization in a-Bi thin films near the superconductor-insulator transition

S.M. HOLLEN, H.Q. NGUYEN, E. RUDISAILE, J. SHAINLINE, Brown University, Department of Physics, G. FERNANDES, J.M. XU, Brown University, Division of Engineering, J.M. VALLES, JR., Brown University, Department of Physics — Ultrathin films near the Superconductor-Insulator Transition (SIT) can exhibit Cooper pair transport in their insulating phase. This Cooper Pair Insulator state is achieved in amorphous Bi films patterned with a nanohoneycomb array of holes. We will present evidence from a number of experiments on these substrates supporting that 1) thickness variations, which result in variations in $T_c$ and $\Delta$, serve to localize the Cooper pairs; 2) the weak links between these superconducting islands control the SIT. Finally, we will discuss our most recent experiments that aim to characterize this Cooper pair insulator state and confirm the role of the thickness variations in the localization of Cooper pairs.

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S. M. Hollen
Brown University, Department of Physics

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