Magnetic Measurements of Micron Sized Rings

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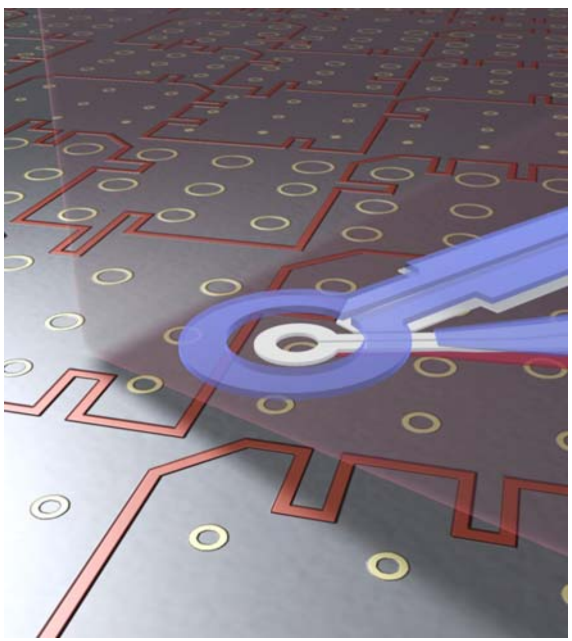
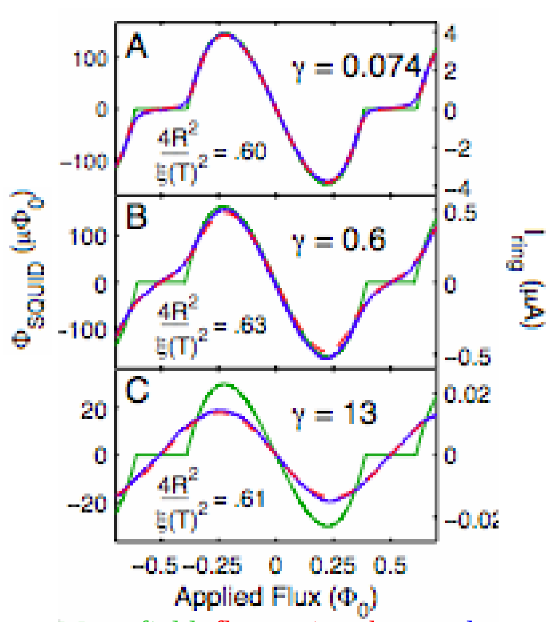
Members of the PI's group have pioneered an approach where a scanning SQUID can systematically study a large array of lithographically patterned objects. Characterization of the sample's response and background response (measured next to the object of interest) allows measurements down to the fundamental noise limits of the SQUID itself. This ability, which is roughly equivalent to a one hundred electron spin sensitivity, has lead to several outstanding physics results in the last year. In the image below shows an artist's rendition of the pickup loop of our scanning SQUID positioned over a field of Superconducting Aluminum Rings. The data shows the ring response as a function of applied field. The green line represents the mean field prediction that the superconducting response should be destroyed due to a Aharonov-Bohm phase gradient around the ring. The technique has allowed us to demonstrate how thermally induced fluctuations can play an important role in this model 1D superconducting system, and how the fluctuations can be characterized by a single parameter, γ.





Mean field, fluctuation theory, data

REFERENCE:
"Fluctuation Superconductivity in Mesoscopic Aluminum Rings," N. C. Koshnick, H. Bluhm, M. E. Huber and K.A. Moler, *Science*, November 30th 2007