Scanning SQUID microscope for studying vortex matter in type-II superconductors

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Abstrak

This thesis presents a novel method for fabricating the smallest superconducting quantum interference device (SQUID) that resides on the apex of a very sharp tip. The nanoSQUID-on-tip displays a characteristic size down to 100 nm and a field sensitivity of 10^-3 Gauss/Hz^(1/2). A scanning SQUID microsope was constructed by gluing the nanoSQUID-on-tip to a quartz tuning-fork. This enabled the nanoSQUID to be scanned within nanometers of the sample surface, providing simultaneous images of sample topography and the magnetic field distribution. This microscope represents a significant improvement over the existing scanning SQUID techniques and is expected to be able to image the spin of a single electron.