

Dr. Chung, Suk Bum (Stanford University): Half-quantum vortices in $p_x + ip_y$ superconductors

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Half-quantum vortices, each with flux of $h/4e$, are needed to realize topological quantum computation in a $p_x + ip_y$ superconductor. However, until recently, there had not been any clear experimental observation of such vortices. We point out, although the magnetic energy is reduced by breaking full vortices into half-quantum vortices, there is an energy cost (which diverges with system size) due to the unscreened spin current and the spin state locking. The recent observation of half-quantum vortices by the Budakian group can be best explained by the fact that the magnetic energy savings can dominate over the spin energy cost in a mesoscopic setting. A finite density vortex lattice may have similar energetics, leading to a lattice of half-quantum vortices. Lastly we show that there can be entropy driven dissociation of a full vortex into two half-quantum vortices.

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