Magnetic Force Acting on a Magnetic Point Dipole Over a Superconducting Thin Film with a Circular Defect

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Abstract

London theory is used to calculate the magnetic levitation force acting on the magnetic point dipole placed above the type-II superconducting thin film with a circular defect. The condition of the position of point dipole to create the first vortex in the thin film is found for $b \ll \wedge$. The difference of the lateral magnetic force ΔFr acting on the point dipole between with and without a single vortex created in the thin film is also derived and used to estimate the force to overcome the pinning force of the vertex due to the circular defect.