Transverse Magnetization of Anisotropic Superconductors

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9.7 cm

The problem of transverse magnetization in anisotropic superconductors, intimately related to their intrinsic torque, emerged after discovery of high temperature superconductivity (HTSC). In this contribution the measurements of low temperature ($T = 1.5 \div 4.2K$) of uniaxial superconductor $2H$ - $NbSe_2$ in a magnetic field of $H = 0 \div 20T$ are presented and compared with the models, developed for HTSC and strictli valid for uniaxial anisotropy. The torque measurements at fields corresponding to reversible magnetization in the mixed state of superconductivity are reasonably well described on the basis of London electrodynamics with phenomenological mass tensor. The torque of this kind originates from the tendency of magnetic Abrikosov vortices to buil up in the specified crystallographic direction. The transverse component of magnetization is separated, the magnetic field penetration depth λ and effective electron mass are estimated. The magnitude of the latter is compared with the magnitude of cyclotron mass, determined from the amplitue of magnetization oscillation with the lowest frequencies, i.e. with c - axis aligned at 77^o from the field direction. The effective masses, derived from the penetration depth and from the magnetization oscillations differ for an order of magnitude. This result is explained in a frame of the simple model, considering specific features of the Fermi surface of the compound under study. The result corresponds to the ratio of the mass tensor components, derived from magnetostriction measurements.

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