Detection of Half-Quantum Vortex between Parallel Plates in Superfluid ^{3}He-A

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In superfluid ^{3}He-A, it was theoretically predicted that the half-quantum vortex (HQV) is stable in the order parameter configuration where the order parameters $\hat{\boldsymbol{d}}$ and $\hat{\boldsymbol{\ell}}$ are perpendicular to each other[1]. However, the existence of the HQV has not been reported so far in experiments with a parallel plate sample cell[2]. We are trying to detect the HQV in ^{3}He-A by using a new technique. In ^{3}He-A, $\hat{\boldsymbol{\ell}}$ is parallel to the surface normal of the sample container, $\hat{\boldsymbol{\nu}}$, due to the anisotropy of ^{3}He-A, and in the presence of a magnetic field, $\boldsymbol{H}$, $\hat{\boldsymbol{d}}$ is perpendicular to $\boldsymbol{H}$ due to the anisotropy of the magnetic energy. If $H > 3$ mT parallel to $\hat{\boldsymbol{\nu}}$ is applied to ^{3}He confined between parallel plates whose gap is as narrow as the dipole coherence length ~ 10 μm, we can obtain a $\hat{\boldsymbol{\ell}} \perp \hat{\boldsymbol{d}}$ texture. In the higher magnetic field and under rotation whose axis is parallel to $\hat{\boldsymbol{\nu}}$, the HQV would be generated[3]. In order to detect the HQV, we will use a rotating cryostat at ISSP[2] and perform cw-NMR measurement. Moreover, we will use a new technique of cw-NMR measurement in which the static magnetic field can be tilted to $\hat{\boldsymbol{\nu}}$.

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