Vortices and vortex rings as a source of electrical activity of superfluid systems

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It is shown that besides a common polarization caused by electrical field, non-uniformity of the medium as well as the motion of the medium give rise to polarization. In superfluid systems vortices and vortex rings are accompanied by specific velocity fields and density inhomogeneity. It results in a unique electrical activity of superfluid systems. In particular, in an electrically neutral superfluid system subjected by magnetic field the vortices carry electrical charge, the vortex pairs and rings carry dipole moment (polarization by Lorentz force). The dipole moment of the vortex pairs and vortex rings is also created by relative motion of normal and superfluid components (polarization by Magnus force). Vortices localized near the boundary and vortex rings of radius comparable with the vessel radius produce near-wall dipole momentum whose value depends considerably on temperature. In this report we consider the factors that influence the effects predicted and discuss the possibilities of experimental observation of such effects.