

Thermal counterflow and electrical activity of superfluid systems in a magnetic field

Monday, 23 December 2019 10:15 (20 minutes)

It is shown that the thermal counterflow in superfluid helium placed in a magnetic field leads to the appearance of an electric field in the surrounding space. The effect is due to the counterflow nature of thermal conductivity in superfluid systems: heat transfer in such systems is associated with the movement of the normal component, but the average mass flow carried by the normal component is compensated by the mass flow carried by the superfluid component. The local mass flow is nonzero. The effect occurs for stationary and non-stationary (second sound) heat flow. The features of the effect for samples with different geometries are considered. It was established that the magnitude of the arising electric field substantially depends on the shape of the sample and the direction of the magnetic field [1].

[1] S.I. Shevchenko, A.M. Konstantinov, JETP Lett. 109, 790-794, (2019).

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Session Classification: Condensed Matter Physics

Track Classification: Condensed Matter Physics