

Persistent currents in mesoscopic loops and networks

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Persistent current was introduced in [1,2] as a property of normal-metallic loop to support the non-decaying in time, dissipationless transport of charge in a steady-state, e.m.f. free condition. This is a property of the nonzero ground state magnetization, and therefore the orbital current in a magnetic field (Landau, Teller), as well as in the presence of Aharonov-Bohm flux in multiply connected conductors. The later property have been implicit in the works of Byers and Yang, Bloch, and possibly others in connection with their discussion of superconducting rings and Josephson effects in superconductors (see a review [3]). We focus on interest of the AB persistent currents to the technologically developing areas of molecular electronics, mesoscopic networks and quantum computers.

[1] I.O.Kulik, JETP Lett., vol.11, p.275 (1970).

[2] M.Buttiker,J.Imry and R.Landauer,Phys Lett. A96, p.365 (1983).

[3] I.O.Kulik, in "Quantum Mesoscopic Phenomena and Mesoscopic Devices in Microelectronics",p.259. Kluwer, Dordrecht, 2000.