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Charge and mass of Cooper pairs in small superconducting rings.
VICTOR VAKARYUK, University of Illinois at Urbana-Champaign — It is well known that response of a neutral fermionic superfluid to rotation or a superconductor to magnetic field and/or rotation involves such characteristics of a Cooper pair as, stretching terms a little, its mass $2m$ and charge $2e$. Here m and e are essentially[1] bare mass and charge of particles constituting the Cooper pair e.g. electrons in case of superconductors. On a phenomenological level this is a consequence of the fact that expressions for currents are written for pairs of particles. We analyze this situation in BCS framework and show that for superfluids mesoscopically constrained in (at least) one spatial dimension the pair's mass and/or charge become smaller than their values for the bulk case (i.e. $2m$ and/or $2e$). One of the implications of this result is the absence of $hc/2e$ harmonic in the response of small superconducting rings or tubes to external magnetic field.

[1]ignoring tiny relativistic corrections

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