Reply to "Comment on 'Vortices induced in a superconducting loop by asymmetric kinetic inductance and their detection in transport measurements' "

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(Received 10 July 2014; published 28 August 2014)

Our calculations, within known limitations of Ginzburg-Landau theory, are fully correct and valid for transport phenomena in asymmetric mesoscopic superconductors, deep in the superconducting state. We deemed the experiments of Burlakov *et al.* [JETP Lett. **86**, 517 (2007)] relevant and important to mention in the general context of our paper since the observed shifts in the oscillations of different quantities are qualitatively similar, even though those measurements are performed close to the superconducting-normal state transition in the so-called Little-Parks regime.

DOI: 10.1103/PhysRevB.90.056502 PACS number(s): 74.78.Na, 73.23.−b

It is well known that the Ginzburg-Landau (GL) theory is an appropriate and very successful tool to explain experiments on mesoscopic superconductors and loops in particular. For example, the observed critical temperature oscillations in mesoscopic superconducting loops, which originate from the effect of flux quantization [1], have been perfectly described by the GL model. In its time-dependent form, the theory predicts new types of magnetoresistance oscillations in mesoscopic superconductors [2] an order of magnitude larger than the Little-Parks oscillations, which also received experimental confirmation very recently [3,4]. This is despite the fact that the GL theory is obtained in the mean-field limit and does not include all possible quantum effects.

In our paper under comment [5] we have conducted a numerical experiment using the time-dependent GL theory to investigate the response of an asymmetric superconducting ring to an external current and a magnetic field. The obtained results have been explained by the interplay of competing currents (transport current and shielding and vortex currents), which was also successfully used in describing the experimentally observed resistance oscillations in symmetric loops (see, e.g., Ref. [1]) and is intimately connected to our recent findings corroborated by experiment [4]. Therefore, there is no doubt that our results are correct and the offered explanations are fully substantiated.

To our understanding, the main reason for the authors to write this Comment is the complexity of the phenomena encountered in their experimental situation, which cannot be explained by the mean-field theories, such as the GL one. We agree with the authors in this aspect since their experiment is firmly in the Little-Parks regime. In our paper, we did not claim to have explained the experiments in question; we merely referred to the earlier experiments on the same system and pointed out the similarity of the magnetic-field dependence of the voltage (compare, e.g., Fig. 6 in our paper and Fig. 4 in Ref. [3]). This was clearly stated in our paper, but we will reiterate it here that our calculations are performed deep in the superconducting state, the observed oscillations are far more pronounced and unrelated to the Little-Parks oscillations, but the observed shifts in the field dependence of different quantities are very similar to those of the experiment.

In conclusion, there is no place for a Comment on our paper since our results are correct and predictions are valid for every transport experiment on asymmetric loops. The experiments mentioned in the Comment were part of the motivation to study asymmetric samples, and further details of those papers are not relevant to our theoretical predictions and explanations.

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