
Kicheon Kang
(Received 27 May 2015; published 10 June 2015)

DOI: 10.1103/PhysRevA.91.069901 PACS number(s): 03.65.Ta, 03.65.Vf, 73.23.–b, 99.10.Cd

Charge quantization of the superconducting shield was incorrectly taken into account for Configuration I (Sec. IV A). Taking the quantization explicitly in the interaction Lagrangian, Eq. (9b) can be rewritten as

\[ L_{\text{int}} = \frac{q}{c} \mathbf{r} \cdot \mathbf{A} + \frac{2e}{c} \sum_{i} \dot{x}_i \cdot \mathbf{A}(x_i), \]

where \( x_i \) denotes the position of the quantized charge in the superconductor. Any charge \( 2e \) induces the phase,

\[ \phi_{2e} = \frac{2e\Phi}{\hbar c}. \]

Due to the quantization of the flux by the integer multiple of \( \hbar c/2e \), the phase \( \phi_{2e} = 2\pi I \) (with an integer \( I \)) does not affect the Aharonov-Bohm effect of the test charge \( q \), regardless of shielding the electromagnetic field. This correction does not influence the following discussion and conclusion of the paper.