

Equivalent electrical circuit of superconductors taking into account magnetic and inertial inductances for superconducting and normal electrons

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To describe transients during excitation of currents in superconductors with both constant and variable electromotive force of the current source, inertial inductances for superconducting and normal electrons (L_s and L_n) in an equivalent electrical circuit in accordance with the two-fluid model of superconductors are introduced. The paper also presents an equivalent electrical circuit of superconductors taking into account magnetic and inertial inductances, which allows us to estimate heat generation in high-temperature superconductors at alternating currents due to the excitation of normal electrons. It is shown that the neglect of certain inertial inductors (L_s or L_n) leads to physical contradictions with the available experimental data on superconductors at alternating currents. In addition, it was found that the total inductance for ordinary (non-superconducting) conductors with current should be represented as a series connection of magnetic inductance associated with a change in magnetic flux and inertial inductance for normal electrons.

Keywords: inertial inductances, equivalent electrical circuit, superconductivity, high-temperature superconductivity, two-fluid model, normal electrons, superconducting electrons.

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