

On equivalent electrical circuit of superconductors at alternating currents

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The paper presents for the first time an equivalent electrical circuit of superconductors according to a two-fluid model for describing transient processes at direct current and non-stationary processes with a harmonic change in the electromotive force (EMF) of a power source.

The scheme introduces inertial inductances for normal and superconducting electrons (L_n , L_s) and effective resistance R_n due to the excitation of normal electrons under the action of an induced electric field. Significant drawbacks in the equivalent electrical circuit of superconductors proposed by other authors are also indicated. The equivalent electrical circuit introduced in the paper makes it possible to describe all transient processes at direct current, as well as to obtain the dependences of normal and superconducting currents, electric field on time and heat dissipation power in a superconductor when normal electrons are excited depending on frequency and temperature.

Keywords: superconductivity, high-temperature superconductivity, HTS, two-fluid model, normal electrons, superconducting electrons, alternating current, equivalent electrical circuit, inertial inductances for superconducting and normal electrons.

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