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The modified London equation for the penetration of an alternating magnetic field into a superconductor in the Meissner state

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For the first time a modified London equation for the penetration of an alternating magnetic field into superconductors of the first and second types in the Meissner state was derived. Within the framework of this equation the dependence of the penetration depth of the alternating magnetic field into the superconductor on the frequency of changes in the magnetic field and the fractions of concentrations of normal and superconducting electrons (α_s u α_n), i.e., in fact, on the temperature of the superconductor, is obtained. Expressions for the penetration depth of an alternating magnetic field are also obtained, taking into account the displacement current in Maxwell's equations and the difference in the effective masses of normal and superconducting electrons. The modified London equation makes it possible to describe unsteady processes in superconductors under an induced electric field that excites both superconducting and normal currents according to the two-fluid model of superconductors.

Keywords: superconductivity, penetration depth of alternating magnetic field, two-fluid model, normal electrons, superconducting electrons, modified London equation, Meissner effect.

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