Abstracts

Modeling the Microwave Properties of Superconductors

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In this paper a macroscopic phenomenological model for the microwave properties of superconductors is presented. The model is based on the idea that there are two kinds of current carriers, and instead of the first London's equation a new equation is derived. This model can be applied to both low- and high-temperature superconductors. Using this model, an expression for the microwave surface resistance is derived and the surface resistance versus frequency is calculated. The results show that the relation between resistance and frequency is not R/sub s/ ~omega² as indicated by both BCS theory and London model, but R/sub s/~omega/sup a/, where a is between 1 and 2 (e.g. a = 1.35) for thin film high-T/sub c/ superconductors YBa/sub 2/Cu/sub 3/O/sub 7-delta/. The temperature dependence of R/sub s/ is simulated using the given model. These relations and the values of the surface resistance agree well with experimental results. A residual resistance may be interpreted from this model.

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