Correspondence

Comments on "Wave Propagation Properties in High-Temperature Superconducting Parallel-Plate Waveguides"

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The above paper[1] contains some fundamental errors. In the Introduction, a new boundary condition for HTS structures, referred to as Meißner boundary condition (MBC), is derived by the author. It is based on (1), which holds for the magnetic field strength within an infinitely thick HTS layer. The author concludes from the continuity of the tangential magnetic field at the boundary of the HTS structure that (1) also holds for the field on the other side (outside of HTS) of the boundary. Since the derivative in the normal direction is not continuous, this conclusion is obviously erroneous and the used MBC (3) is incorrect. Instead of the MBC, the well-known surface impedance concept should be used to model the structure. Neglecting RF losses in HTS due to quasi-particle scattering, this correct boundary condition reads for the tangential parts of the electric and magnetic fields

$$\overset{\rho}{E}_t = j\omega\mu_0\lambda_{\mathrm{L}}\overset{\varpi}{n} \times \overset{\rho}{H}_t \tag{1}$$

or equivalently for the tangential and normal parts of the magnetic field

$$\frac{\partial \overset{\rho}{H}_t}{\partial n} - (grad H_n)_t + k_0^2\varepsilon_r\lambda_L\overset{\rho}{H}_t = 0 \tag{2}$$

with k_0 as the free-space wave number and ε_r as the permittivity of the material outside of HTS. It is clearly seen that (2) controverts the MBC used by the author.

As a result of the incorrect boundary condition, the HTS surface is incorrectly modeled as a magnetic wall with $H_t \approx 0$. Consequently, the waveguide fields presented are the fields of structures with magnetic walls, but not of HTS structures.

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[1]J.-G. Ma, *IEEE Microwave Guided Wave Lett.*, vol. 9, pp. 183–185, May 1999.