Abstracts

Line Impedance and Propagation Coefficient of Narrow Superconducting Coplanar Lines Made of YBaCuO

J. Berntgen, E. Waffenschmidt, J. Musolf, X. He, M. Heuken, K. Heime, S. Hofschen and I. Wolff. "Line Impedance and Propagation Coefficient of Narrow Superconducting Coplanar Lines Made of YBaCuO." 1996 Transactions on Microwave Theory and Techniques 44.2 (Feb. 1996 [T-MTT]): 318-325.

The microwave properties of coplanar waveguides with line widths from 1 µm to 40 µm made of superconducting YBaCuO films with a thickness t = 180 nm on LaAIO/sub 3/ are investigated. The line impedance Z/sub L/ and the normalized propagation coefficient beta/beta o of these waveguides are measured between 45 MHz and 26.5 GHz at temperatures between 77.4 K and 92 K. The ratio of the line width w to the distance of the ground layers d is constant with w/d = 0.2. Therefore, Z/sub L/ and beta/beta/sub 0/ are independent of w for perfectly conducting waveguides. For superconducting waveguides it is found that Z/sub L/ and beta/beta/sub 0/ differ from the values of perfectly conducting waveguides. They increase for smaller line widths at a constant temperature. At w = 1 µm and T = 80 K, Z/sub L/ and beta/beta/sub 0/ are nearly twice as high as calculated for perfect conductors. Furthermore, Z/sub L/ and beta/beta/sub 0/ increase with the temperature. It is shown that these effects are attributed to an increase of the inductance per unit length L' due to the superconducting material, whereas the capacitance per unit length C' behaves like C' of perfectly conducting waveguides. Using these results, the dimensions of the superconducting waveguides, which are necessary to obtain a desired Z/sub L/ at a given line width w, are calculated.

❑ Return to main document.