Abstracts

Attenuation and Dispersion for High-T/sub c/ Superconducting Microstrip Lines

E.B. Ekholm and S.W. McKnight. "Attenuation and Dispersion for High-T/sub c/ Superconducting Microstrip Lines." 1990 Transactions on Microwave Theory and Techniques 38.4 (Apr. 1990 [T-MTT]): 387-395.

We have calculated the attenuation and dispersion of microstrip lines of the high-T/sub c/ superconductor YBa/sub 2/Cu/sub 3/O/sub 7/ (YBCO) on yttria-stabilized zirconia (YSZ) substrates as a function of frequency and temperature. YBCO is modeled as a BCS superconductor with a critical temperature T/sub c/= 90 K and a superconducting energy gap 2Delta= 4.5kT/sub c/. The effect on pulse propagation of superconducting and modal dispersion in addition to the attenuation is demonstrated. At 60 K, microstrip lines of YBCO are significantly less attenuating at frequencies below 500 GHz than microstrip lines of copper at the same temperature. This advantage is particularly significant at the higher attenuations that result as the substrate thickness is made smaller for miniaturization or to improve the microstrip line bandwidth. The application of YBCO for microstrip lines appears to be most useful at frequencies above 100 GHz and dielectric thicknesses less than 100 µm, where the attenuation of cooled copper is prohibhively large. Cooled to temperatures below 20K, YBCO may make possible a new generation of extremely high bandwidth (~5 THz), small feature size (~5 µm) circuits and devices.

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