Abstracts

Spectral transmittance of lossy printed resonant-grid terahertz bandpass filters

M.E. MacDonald, A. Alexanian, R.A. York, Z. Popovic and E.N. Grossman. "Spectral transmittance of lossy printed resonant-grid terahertz bandpass filters." 2000 Transactions on Microwave Theory and Techniques 48.4 (Apr. 2000, Part II [T-MTT] (Special Issue on Terahertz Electronics)): 712-718.

In this paper, we present terahertz bandpass filters composed of resonant arrays of crossed slots in lossy metal films deposited on dielectric membranes. The filters exhibit insertion loss as low as 1.9 dB at room temperature and 1.2 dB at 77 K at a center frequency of 2.2 THz. It is found that the dielectric substrate introduces a downward shift in frequency not predicted by standard mean dielectric-constant approximations. This shift is proportional to the permittivity and thickness of the substrate, and is accurately modeled for polyester, fused quartz and silicon substrates using a finite-difference time-domain (FDTD) model. It is also found that the insertion loss and Q-factors of the filters vary with the product of the thickness and conductivity of the metal film for lead and gold films, even in cases when the thickness is several skin depths at the center frequency. The FDTD theory presented here accounts for some of the conductor losses.

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