Abstracts

A low-cost fabrication technique for symmetrical and asymmetrical layer-by-layer photonic crystals at submillimeter-wave frequencies

R. Gonzalo, B. Martinez, C.M. Mann, H. Pellemans, P.H. Bolivar and P. de Maagt. "A low-cost fabrication technique for symmetrical and asymmetrical layer-by-layer photonic crystals at submillimeter-wave frequencies." 2002 Transactions on Microwave Theory and Techniques 50.10 (Oct. 2002 [T-MTT]): 2384-2392.

This paper presents a rapid, versatile, and practical technique for the manufacture of layer-by-layer photonic crystals in the millimeter- and submillimeter-wave regions. Mechanical machining is used to derive a rugged layer-by-layer structure from high-resistivity silicon wafers. Unlike traditional anisotropic etching techniques, this method does not rely on any particular crystal orientation of the substrate and allows greater flexibility in the photonic crystal design. Automatic alignment of alternating layers is achieved via careful placement of the separation cuts. Using this ability, two configurations of photonic crystals are realized and their RF characteristics are measured and presented. Firstly, a symmetrical photonic crystal is studied as an initial demonstration of the technique. This is followed by an asymmetrical example, where a different frequency response is observed for the two orthogonal polarizations of the incident radiation. Two measurement techniques are used to characterize the photonic crystals and the merits of each are discussed. Theoretical predictions are seen to agree well with the measured behavior.

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