Abstracts

Application of Microwave Concepts to the Theory of Acoustic Fields and Waves in Solids

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During the past 20 years the value of the microwave approach to electromagnetic field problems has been amply demonstrated. The purpose of this paper is to show the basic similarity of acoustic and electromagnetic field equations and to exploit this fact in applying microwave methods to acoustic resonator and waveguide problems. This is accomplished most directly and efficiently by using symbolic notation, rather than tensor subscripts, for the acoustic fields. The usefulness of this notation is illustrated by the problems of plane wave propagation and piezoelectric stiffening in an anisotropic medium, and by derivations of Poynting's and reciprocity theorems for a piezoelectric medium. Piezoelectric resonators are treated in detail from the point of view of normal mode expansions. A general network representation is obtained and is applied to the disk transducer, as an example. Normal mode theory of piezoelectric waveguides is briefly sketched and a perturbation theorem, which can be applied to both resonator and waveguide problems, is derived.

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