Abstracts

Microwave Network Methods for Guided Elastic Waves

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The possibility of obtaining true microminiaturization by the use of elastic wave circuitry on solids is hampered by the lack of knowledge regarding the behavior of the constituents of those circuits. Since boundary value problems involving elastic waves in solids are generally very intricate and difficult to solve, a direct frontal attack on those problems will in many cases lead to frustration. In this paper, a series of steps is outlined which avoids the frontal attack and lends itself to a systematic procedure for achieving the understanding sought. It involves the application of concepts and techniques of proven value in electromagnetic microwaves to corresponding categories of problems in elastic guided waves. To demonstrate the value of this approach, it is used to derive the properties of several well-known types of elastic wave on layered media, such as Rayleigh surface waves, leaky Rayleigh waves, Lamb waves, and Love waves. In the building-block approach employed, the results derived separately include transmission-line models for body waves in fluids and isotropic solids, with expressions for the characteristic impedances and the velocity and stress vector mode functions, and equivalent networks for several types of interface which are constituents of the layered media mentioned above. The propagation properties of the guided waves are then obtained by the use of the transverse resonance procedure in a systematic, simple, and direct fashion.

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