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A Two-Dimensional Analysis of Surface Acoustic Waves in Finite Anisotropic Solids with Electrodes

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Analytical solutions of surface acoustic waves in finite solids with electrodes are of great interests in both theoretical study and practical applications, and the two-dimensional theory based on the expansion of the exact solutions from semi-infinite solids offers an excellent two-dimensional theory with complete equations and boundary conditions similar to well-known plate theories for high frequency vibration applications. By considering the electrode layer on a piezoelectric substrate, the effects are evaluated through the integration of displacement fields along the thickness direction, effectively including both mass and stiffness. Extending these solutions to substrates with periodic electrodes, we can study the surface acoustic waves for accurate prediction of the phase velocity and displacement fields, thus enabling detailed analysis for actual resonator devices. We conclude this study with straight-crested wave solutions of surface acoustic waves in a finite solid with electrode to demonstrate the theory, solution technique, and the applications.

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