Wave Momentum and Quasi-Particles in Physical Acoustics (World Scientific Series on Nonlinear Science Series a)

Gerard A Maugin, Martine Rousseau

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This unique volume presents an original approach to physical acoustics with additional emphasis on the most useful surface acoustic waves on solids. The study is based on foundational work of Léon Brillouin, and application of the celebrated invariance theorem of Emmy Noether to an element of volume that is representative of the wave motion.

This approach provides an easy interpretation of typical wave motions of physical acoustics in bulk, at surfaces, and across interfaces, in the form of the motion of associated quasi-particles. This type of motion, Newtonian or not, depends on the wave motion considered, and on the original modeling of the continuum that supports it. After a thoughtful review of Brillouin's fundamental ideas related to radiative stresses, wave momentum and action, and the necessary reminder on modern nonlinear continuum thermomechanics, invariance theory and techniques of asymptotics, a variety of situations and models illustrates the power and richness of the approach and its strong potential in applications. Elasticity, piezoelectricity and new models of continua with nonlinearity, viscosity and some generalized features (microstructure, weak or strong nonlocality) or unusual situations (bounding surface with energy, elastic thin film glued on a surface waveguide), are considered, exhibiting thus the versatility of the approach.

This original book offers an innovative vision and treatment of the problems of wave propagation in deformable solids. It opens up new horizons in the theoretical and applied facets of physical acoustics.

Readership: Graduate students and researchers in applied physics and mathematics, as well as accousticians.

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