

Gapped momentum states in analysis of mechanical models of viscoelasticity

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Gapped momentum states are often associated with dissipation and open systems. It is fundamental to different areas of physics, such as strongly-coupled plasma, electromagnetic waves, quasihydrodynamic approach [1]. The paper presents the derivation of dispersion relations based on the basic mechanical models of viscoelasticity: Maxwell, Kelvin-Voigt and Standard Linear Solid. Analytical solutions of dispersion relations for the proposed models are obtained, conditions and criteria for the formation of a gap in momentum space are formulated. An analysis of dispersion relation are carried out for a mechanical model [2] to link relaxation properties with collective modes providing new mechanisms of momentum transfer. The resulting spectrum of wave numbers is important for describing thermodynamic properties of the system and dynamics of collective modes on characteristic scales.

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