Seminário Luiz Adauto Medeiros de Análise e EDP

13/08/2025 às 12:10h

IM-UFRJ, CT sala C-116

Asymptotic Analysis of the Wave Propagation in the Diatomic Lattice: Continuous model

Sergey Sergeev

Resumo: The diatomic crystal model, first systematically studied by Born and von Kármán, and Brillouin in the early 20th century, remains one of the fundamental models in solid state physics. Despite decades of research focusing on long-wavelength approximations and discrete lattice analysis, the continuous analogue of the diatomic lattice equations and the associated Cauchy problem have received surprisingly little attention in the literature.

We present a novel approach to analyzing wave propagation in one-dimensional diatomic crystals by developing a continuous model that preserves the complete physics of the discrete lattice. Using pseudodifferential operator techniques, basing on the Maslov's ideas, we construct a system of coupled continuous equations.

We formulate the Cauchy problem and provide the analytical asymptotic formulae for the solution of the continuous model. Our results reveal previously unrecognized results depending on the wave propagation and offer new insights into the fundamental physics of wave propagation in crystalline materials.

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