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Influence of Collisional Effects on Ion-Acoustic Wave Properties in Non-Maxwellian Laser-Heated Plasmas

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Collisional effects can significantly influence hohlraum plasmas dynamics, where non-Maxwellian inverse Bremsstrahlung heating and collision-induced anisotropy alter the plasma's kinetic response. We have derived the linear dispersion relation for ion acoustic waves (IAW), revealing the necessity of accounting for binary collisions in both the isotropic and anisotropic components of the electron distribution function. This affects the IAW damping rate, either increasing or decreasing it, depending on the laser parameters and plasma composition. Additionally, we discuss the influence of speckle distribution on inverse Bremsstrahlung, using a statistical approach. Our analytical results are compared with particle-in-cell simulations. Our study provides crucial insights for high-energy laser-driven implosion experiments and can be integrated into wave mixing processes involving IAWs, such as cross-beam energy transfer and Brillouin scattering.