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Impact of Magnetic Field-Modified Ion Streaming on Shear Viscosity and Conductivity in Strongly Coupled Dusty Plasma

The core objective of this study was to quantitatively determine the shear viscosity and thermal conductivity the key transport properties of strongly coupled dusty plasma when subjected to both ion streaming and an external magnetic field. Using Langevin dynamics simulations, we modeled the complexities introduced by the ion stream (typically from sheath electric fields) and its subsequent modification by the magnetic field. By applying the Green-Kubo integral formulae, we successfully computed these transport coefficients across a broad parameter space, encompassing variations in the Coulomb coupling (Γ), Screening parameter (κ), Mach number (M), Neutral pressure (Nn), and Magnetic field strength (B). The findings elucidate the critical role of inter-particle interactions in mediating the transport behavior under these combined external influences.

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