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Self-Consistent Phase-Space Moment Description of High-Energy-Density Plasma Jets[1] JING ZHOU, CHIPING CHEN, Intense Beam Theoretical Research Group, Plasma Science and Fusion Center, MIT, Cambridge, MA 02139 — A self-consistent phase-space moment description is developed for high-energy-density plasma jets. The phase-space moment theory is the truncated moment average of the kinetic equation. Using the phase-space moment theory, the root-mean-square (rms) envelope equations, which describe the orientation and size of the plasma jet, are derived for high-energy-density plasma jets. The envelope equations are demonstrated to agree with the virrial theorem, which is the one of the most fundamental theorems in plasma physics. As an example, the rms envelope equations are solved for a co-axial plasma jet accelerator, where the collisions and radiation transport are considered negligibly small. The rms envelope equations can be used to study the energy density ultimately achievable in a plasma jet as it is ejected from a plasma gun and subsequently undergoes compression by inertia.

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Jing Zhou

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