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Self consistent effects in the ponderomotive acceleration of electron beams

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This work investigates the behavior of a free-electron laser (FEL) system composed of a slowly modulated wiggler field, constant laser field amplitude, and self-consistent fields due to the charged particles. The dynamics of each particle of the beam is studied through a Hamiltonian formalism, from which a ponderomotive approach represents its mean motion. The purpose of the present analysis is precisely to add collective effects into the description of electron acceleration in the inverse free-electron laser device described previously. The transverse self-consistent beam dynamics has been largely analyzed and understood when beams are transported at constant axial speeds, in the absence of accelerating fields. However, when accelerating fields are turned on, and the beam velocity is no longer constant, the system's behavior changes significantly.

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Footnotes

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Yes

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