WAVE-PARTICLES INTERACTIONS: FREE ELECTRON LASER VS. TRAVELING WAVE TUBE

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Abstract

Wavel-lparticle interactions are central to the operation of plasmas and electronic devices. Transfer of energy from fast beams to waves enables to employ traveling wave tubes as widel-lband amplifiers for space and communication purposes and freel-lelectron lasers as tunable coherent light sources. Both electronic devices can be modeled by a selfl-lconsistent Hamiltonian system where a finite number N of particles and a finite number M of waves are treated on the same ground through a couple of conjugate variables for each particle or wave [*]. Recently, the exploration of chaotic dynamics of test particles in a specially designed traveling wave tube [*] allowed to test new methods for channeling chaos [**]. The control of the coupled lightl-lelectron dynamics is a topic of paramount importance in view of the optimization of the freel-lelectron lasers performance [***]. The theoretical and experimental analogies between two different experimental configurations can be the source of exciting developments for the control of the wave saturation level and improvement of device performance.

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