

## **Transition to self-focusing regime in a spatially modulated electrostatic field particle accelerator**

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A charged particle can be self-focused and accelerated simultaneously by an electrostatic modulated wave. It occurs under proper conditions, which depend on the initial longitudinal and transversal velocities of the particle, the amplitude, phase-velocity and the shape (longitudinal and transverse length scales) of the wave. However, there are also three different regimes: the particle could pass through the wave suffering no substantial acceleration (passing regime); the particle could be reflected by the wave (reflecting regime); and, the particle could be accelerated with no self-focusing. In this work, we provide the full set of equations of the proposed model and a modulational approximation that describes the dynamics of the particle in the case of no acceleration. We explore here how occur the transitions between these regimes by analysing the dynamics of the particle through numerical simulations.