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Wakefields and Impedances

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In beam dynamics, low intensity particle beams can be satisfactorily modelled using the single particle approach, in which it is sufficient to describe the motion of particles through the external electromagnetic fields, while neglecting all other types of interactions. Conversely, the evolution of high intensity particle beams must be described including not only the externally applied electromagnetic fields but also the mutual interactions between beam particles as well as the interactions of beam particles with their surrounding environment. All the perturbations to the motion induced by the additional driving terms associated to these interactions are known as collective effects. The powerful tools of the kinetic theory in plasma physics and self-consistent multi-particle simulations including the beam-induced fields are needed to model the dynamics of particle beams in this regime.

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