

Physics and Applications of High Brightness Beams



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Parasitic wakefield effects in multi-pulse driver beams for PWFA schemes

Particle driven plasma wakefield acceleration (PWFA) exploits the intense wakefields excited in a plasma by a high brightness driver beam in order to accelerate a trailing, properly delayed witness beam. Moreover, multi-pulse driver beams with suitable spacing resonantly excite the plasma which enhances the amplitude of the accelerating field. However, before the injection into the plasma stage occurs, the pulsed beam is exposed to the action of parasitic wakefields induced by the surrounding beamline which can introduce significant energy spread and emittance dilution. Here we investigate the effects of short-range wakefields which are responsible for intra-beam coupling in the multi-driver time structure. Simplified approaches for the evaluation of the wakefield interaction in presence of space charge forces are utilized in a custom tracking code framework. Reference cases are illustrated to provide examples investigating the performance of state-of-the-art facilities.

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