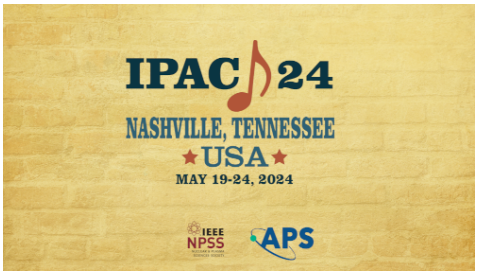

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Simulating the transverse probing of laser-driven plasma wakefields using ultrarelativistic electrons

Sunday, 19 May 2024 16:00 (2 hours)

Laser wakefield accelerators (LWFAs) are capable of supporting accelerating and focusing forces on the order of 10–100 GeV/m, about three orders of magnitude greater than conventional RF accelerators. While theoretical solutions for the electromagnetic (EM) focusing fields have been developed, the field structures have yet to be verified experimentally. In this poster, we present simulation results for transverse probing of laser wakefields using ultrarelativistic electrons. We study the behavior of the probing electrons by implementing filtering masks to investigate focusing characteristics of thin electron "bands". The deflection of these bands after propagating through the wakefield is then used to characterize the EM forces. The simulated focusing behavior of these electron bands is in reasonable agreement with a theoretical model developed based on a thin lens model of the wakefield. Simulation results show the focusing of the bands to be an effective experimental diagnostic for verifying the EM field structure. This provides an analytic framework needed for the first direct measurements of focusing forces in an LWFA at the Accelerator Test Facility at Brookhaven National Lab.

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