

Recent progress in the modeling of laser wakefield acceleration

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The demonstration of a multi-stage scheme is one of the milestones to make laser wakefield acceleration (LWFA) a scalable acceleration mechanism to reach high energies. The design of such complex scheme will require advanced multi physics modeling of the different components of the machine and integrating data-driven approaches into the exploration of the parameter space of interest.

A selection of recent results addressing these challenges in close synergy with experiments will be reviewed, such as the fast reconstruction of the laser pulse field transverse profile for accurate modeling to obtain unprecedented agreements with experimental results, the online shaping of the laser pulse characteristics to reduce the accelerated beams' energy spread, a fast and accurate reduced model for Particle in Cell modeling of ionization injection allowing massive data generation for machine optimization and Artificial Intelligence for LWFA.

Autori principali: CROS, Brigitte (LPGP-CNRS-UP11); MINENNA, Damien (CEA IRFU); MASSIMO, Francesco (LPGP - CNRS); MOULANIER, Ioquin (Laboratoire de Physique des Gaz et Plasmas); DICKSON, Lewis; NGHIEM, Phu Anh Phi (CEA); MARINI, Samuel (CEA)

Relatore: MASSIMO, Francesco (LPGP - CNRS)

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