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Laser experimental profiles initialization in PIC simulations

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The study of laser-plasma interactions deeply relies on *Particle-in-cell* (PIC) simulations due to the complexity and the high non-linearity of the physics involved. In this regard, PIC simulations are a powerful instrument in modeling and predicting the outcomes of a Laser Plasma Accelerator experiment. However, the results of this kind of simulations can be profoundly different from the experimental reality because of the initialization of highly idealized laser fields not accounting for the effects of phase aberrations.

In this work, we present the development of a numerical tool to retrieve the phase and rebuild the transverse profile of laser fields from Near Field (NF) and Far Field (FF) fluence measurements to be then automatically initialized in a FBPIC simulation through a properly customized interface

The phase retrieval is based on the *Gerchberg-Saxton algorithm*, where the reconstruction of fields is obtained with a Fourier-based Fresnel propagator. Main features of *Laser Pulse reconstructor For Particle In Cell simulations* (LP4PIC) will be shown with some examples and comparisons, also in terms of PIC simulation results.

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