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Recent orientations in the Smilei particle-in-cell simulation software

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Smilei is an open-source particle-in-cell (PIC) simulation code. It is developed by a collaboration of scientific computing experts and plasma physicists for applications ranging from astrophysics to laser-plasma interactions. In order to address this large variety of scientific cases, Smilei gathers many different features in a single software suit and adopts flexible data structures and methods. In this presentation we want to introduce two major evolutions of the code which have a direct impact in the field of laser-wakefield acceleration. The first is a vectorized version of the PIC operators. The proposed implementation aims at remaining efficient even for relatively low and contrasted numbers of particles per cell. The second is the possibility of a decoupled domain decomposition for fields and particles. This approach allows to keep small domains for particles, necessary for a good load balancing, while having large domains for the fields, thus minimizing synchronization and improving spectral solvers resolutions.

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