



Contribution ID: 1826 Contribution code: TUPA100

Type: **Poster Presentation**

Modeling of Plasma Accelerators with the Exascale Code WarpX

Tuesday, 9 May 2023 16:30 (2 hours)

The electromagnetic Particle-In-Cell (PIC) code WarpX has been developed by the U.S. Department of Energy's Exascale Computing Project, in collaboration with international partners, toward the modeling of plasma accelerators on Exascale Supercomputers. We will give an overview of the code and its latest features, such as collision and QED physics modules. We will also report on the latest algorithmic advances that enable full PIC modeling of plasma accelerators with higher efficiency, including a time-averaged pseudo-spectral PIC solver that enables larger timesteps, a hybrid nodal-staggered PIC loop that provides improved stability, an algorithm to handle particles crossing Perfectly Matched Layers, application of mesh refinement to the modeling of ion motion in a plasma accelerator. All presented features are fully CPU and GPU (Nvidia/AMD/Intel) capable and run to full-scale on the world's largest supercomputers. The status, examples of applications and future developments will be discussed.

Funding Agency

Work supported by the U.S. DOE Exascale Computing Project (17-SC-20-SC), and by the Office of High Energy Physics, U.S. Dept. of Energy under Contract No. DE-AC02-05CH11231.

Footnotes

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Yes

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Session Classification: Tuesday Poster Session

Track Classification: MC3: Novel Particle Sources and Acceleration Techniques: MC3.A22: Plasma Wakefield Acceleration