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TRANSFORMATIVE PETASCALE PARTICLE-IN-CELL SIMULATIONS

Research Challenge

The team focused on three key questions:

1. Can plasma-based acceleration be the basis of new compact accelerators?
2. Can laser plasma instabilities be controlled or harnessed in inertial fusion plasmas?
3. What are the collective processes responsible for the formation of shocks in collisionless plasmas?

Methods & Codes

Particle-In-Cell (PIC) codes employed:

- OSIRIS
- QuickPIC
- UPIC

These codes are locally developed by the UCLA simulation group and freely available.

Why Blue Waters

Blue Waters provides the largest, time-tested, and stable supercomputing platform in the world. The combination of CPU and GPU nodes suits almost all research supercomputing needs and has provided a productive computational environment since the very beginning of the system.

Results & Impacts

Large-scale PIC simulations were performed and will impact the design of future experiments in plasma-based accelerators and inertial confinement fusion.