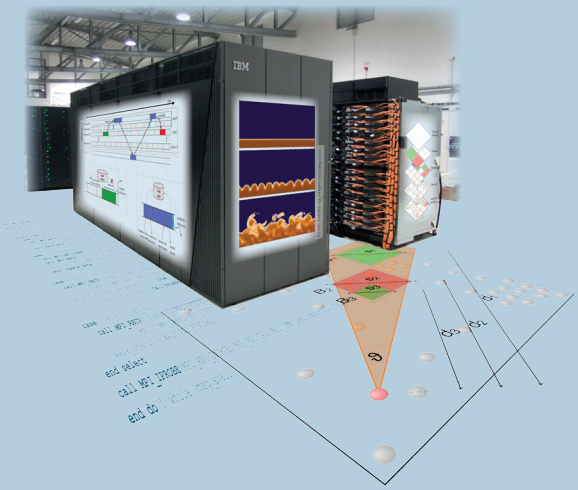
JÜLICH
FORSCHUNGSZENTRUM

Simulation Laboratory Plasma Physics

Laser-particle acceleration to fusion devices on HPC Systems



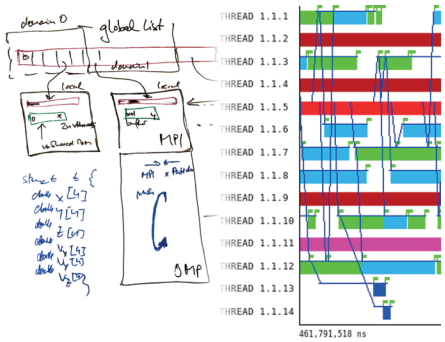
- Exascaling of plasma simulation codes
- Foster expertise in kinetic and fluid algorithms
- Research in advanced plasma simulation techniques
- Transfer HPC know-how to plasma community

Research & Support Activities

- Laser-plasma particle and radiation sources
- Plasma-wall interfaces
- Particle-in-Cell simulation
- Mesh-free kinetic methods
- Parallel tree codes
- Parallel algorithm design
- Boosting parallel I/O and scaling
- Code clinics
- JUQUEEN porting and tuning workshops
- Extreme scaling workshops
- Porting to exascale prototypes
- Owner of 2 codes in High-Q Club

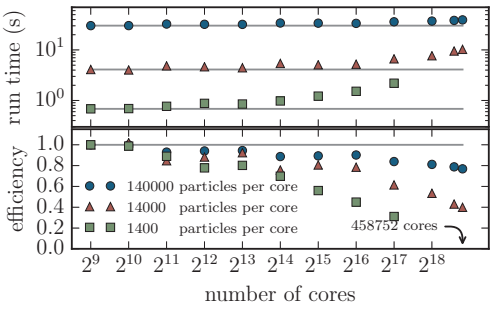
Projects & Collaborations

- EoCoE: Energy Oriented Centre of Excellence (EU)
- JSC Exascale Labs: ExaCluster Laboratory (ECL), POWER Acceleration and Design Center (PADC)
- KU Leuven



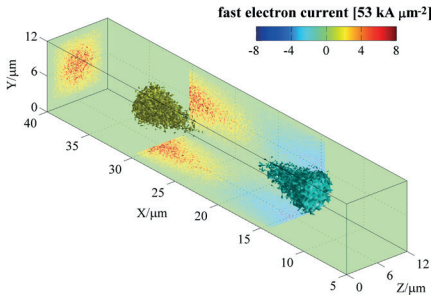
Algorithm Development

With the recent advent of many-core architectures and new accellerator units, additional layers of parallelism beyond MPI have to be added to existing scientific codes for making efficient use of the available computing power.



High-Level Support

Weak scaling of the tree code PEPC on the BlueGene/Q installation at JSC with up to 1,668,196 parallel threads. Overlapping communication and computation hides latency, while a hybrid parallelization scheme leads to a smaller memory footprint and reduces communication.



Plasma Simulations

3D particle-in-cell simulation results on collimated transport of fast electrons (>0.5MeV) in an extremely high density plasma. These electrons are well confined by an external magnetic field after they are generated by two counter-propagating ultra-short laser pulses of $6 * 10^{20} W/cm^2$.

Contact: slpp@fz-juelich.de | **Website:** www.fz-juelich.de/ias/jsc/slpp