

Exascale Particle-in-Cell Simulations – A glimpse into the future

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We present our experiences made and lessons learned preparing, running and analyzing particle-in-cell simulations of laser plasma interaction on the world's largest high performance computer systems. Challenges we encountered range from optimizing codes on heterogeneous many-core hardware, including GPUs, PByte-size I/O at high rates and subsequent data analysis, large-scale visualization, synthetic diagnostics, simulations as a service, software engineering in international teams, rapid code prototyping, open data formats, citing codes & data.

We will introduce Open Source tools and solutions we develop to address these challenges as well as the underlying techniques. We will end with a glimpse into the future of what we think can be expected when dealing with Exascale systems and what will be needed to make best use of these upcoming systems.