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PIConGPU –the 3D3V particle-in-cell code developed at HZDR –a status update

Monday 30 January 2017 15:35 (20 minutes)

PIConGPU is currently the fastest particle-in-cell code in the world. New physics models are continuously developed and, after thorough testing, included in our open-source software.

In this talk we will give an overview on the recent upgrades in PIConGPU, covering new ionization schemes including ADK, Keldysh and collisional ionization, a QED and bremsstrahlung module that brings photons to the code, and various new laser implementations to better model lasers used in experiments and to enable the simulation of novel light source concepts like TWTS. We will present various synthetic diagnostic methods such as the spectrally resolved radiation detectors, the in-situ phase space diagnostic and our ParaTAXIS framework, which is able to simulate small angle photon scattering of an external x-ray pulse probing laser-driven solid-density targets. Furthermore, we will briefly discuss numerous code improvements which boost performance, unify data exchange and analysis via the openPMD standard for open, reproducible science, and our steerable live visualization. Finally we will showcase several simulations ranging from laser wakefield acceleration via ionization injection, to ion acceleration via laser interaction with spherical, perfectly isolated, mass-limited targets (both experimentally realized) to radiation signatures of a shear surface instability.

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