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## Next-Generation Simulations for XFEL-Plasma Interactions with Solid Density Targets with PIConGPU - Solutions for Predictive 3D Modeling

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PIConGPU reportedly is the fastest particle-in-cell code in the world with respect to sustained Flop/s. Written in performance-portable, single-source C++ we constantly push the envelope towards Exascale laser-plasma modeling. However, solving previously week-long simulation tasks in a few hours with a speedy framework is only the beginning.

This talk will present the architecture and recent additions driving PIConGPU. As we speak, we run on the fastest machines and the community approaches a new generation of TOP10 clusters. Within those, many-core computing architectures and severe limitations in available I/O bandwidth demand fundamental rethinking of established modeling workflows towards in situ-processing.

We present our ready-to-use open-source solutions and address scientific repeatability, data-reduction in I/O, predictability and new atomic modeling for XFEL pump-probe experiments.

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