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## **PIConGPU + X – Building blocks for successful Exascale accelerator simulations**

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Exascale computing is close to becoming a reality. As technology progresses, it has become clear that heterogeneous computing is going to stay and adapting to new hardware is an ongoing challenge. Since 2015 PIConGPU has paved the way to accelerating plasma simulations across compute platforms using the Alpaka framework. This has enabled early adaption to new compute hardware and readiness for Exascale compute capabilities.

However, experience has shown that the real challenges are of a different nature. The first is in detailed analysis of the data produced in simulations. Here, we present our current work on I/O, code coupling, visual analytics and large-scale data analytics.

The second, and more pressing challenge, is comparison to experiment. Here, not only has the increasing quality of experiments put more demand on simulation quality, but more and more the demand for fast, close to real time analysis has grown. This puts high quality simulations to the test, as runs on supercomputers tend to be costly. We present workflows to match experiment and simulations and a future look on how feedback loops between experiment and simulation can be optimized.

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**Primary authors:** BUSSMANN, Michael (Helmholtz-Zentrum Dresden - Rossendorf); Dr DEBUS, Alexander (Helmholtz-Zentrum Dresden - Rossendorf, Bautzner Landstrasse 400, 01328 Dresden, Germany); STEINIGER, Klaus (Helmholtz-Zentrum Dresden - Rossendorf, Bautzner Landstrasse 400, 01328 Dresden, Germany); Mr WIDERA, Rene (Helmholtz-Zentrum Dresden-Rossendorf); KLUGE, Thomas (HZDR); PAUSCH, Richard (Helmholtz-Zentrum Dresden - Rossendorf, Bautzner Landstrasse 400, 01328 Dresden, Germany); Dr HOFFMANN, Nico (Helmholtz-Zentrum Dresden - Rossendorf); Prof. SCHRAMM, Ulrich (Helmholtz-Zentrum Dresden-Rossendorf); Mr POESCHL, Franz (Helmholtz-Zentrum Dresden - Rossendorf)

**Presenter:** Dr DEBUS, Alexander (Helmholtz-Zentrum Dresden - Rossendorf, Bautzner Landstrasse 400, 01328 Dresden, Germany)

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