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Integrating Sustainable Computational Strategies in Light Source Accelerator Upgrades

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The operation of light source accelerators is a complex process that involves a combination of empirical and theoretical physics, simulations, and data-intensive methodologies. For example, the FLASH1 beamline at DESY is upgrading to an external seeding FEL light source*. We utilize special diagnostics, machine learning algorithms, and comprehensive simulations to achieve this. To optimize resources, we constantly look to improve our approach, allowing us to robustly control the accelerator and meet the desired stability of our users. Machine learning and GPU-based algorithms have become crucial, enabling us to employ advanced optimization techniques and possibly AI. However, in many cases, it is imperative to establish a robust mechanism for simulations involving large particle numbers to ensure that future upgrades and experiments can effectively and sustainably leverage these computational strategies.

Footnotes

- New opportunities for excellent FEL experiments at FLASH (another contribution to the IPAC 2024 conference)

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