

Physics and Applications of High Brightness Beams



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An open source platform for integrated design and control of compact radiation sources

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The international collaboration towards a 5th-generation lightsource should adopt an open source platform to enable a) instantaneous collaboration between distributed design teams; b) code benchmarking, multiphysics and code chaining for end-to-end simulation; c) multi-level user support for all relevant codes, from GUI to supercomputer; d) applicability to all subsystems individually, including support for surrogate model development; and e) automatic integration with control systems for testing, commissioning and operation. Sirepo is a framework for cloud computing, which partially or fully satisfies many of these demanding requirements today and has been openly developed on GitHub since its inception in 2015. Sirepo.com is a free scientific gateway for the worldwide community. The recently deployed Sirepo-Omega app demonstrates the integration of OPAL, elegant and GENESIS for end-to-end FEL modeling. Sirepo-Bluesky is an open source integration that is actively used for X-ray beamline controls at NSLS-II. Additional support for accelerator controls is planned. Recent work on relevant subsystems will be discussed: laser-plasma channels; LLRF for C-band linacs; thermal effects in high-rep-rate Ti:Sapphire laser amplifiers; beam loading in high-current linacs; radiation transport and shielding; as well as surrogate models for photoinjectors.

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