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Modeling of a Laser-Assisted Bunch Compression Scheme for a Compact Free-Electron Laser

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Reducing the size of free-electron laser (FEL) light sources relies on producing bright electron beams and preserving the beam brightness during acceleration and beam manipulation. The laser-assisted bunch compression (LABC) scheme is a promising technique to significantly enhance the beam current for a very low emittance beam. We explore the application of the LABC scheme to a compact FEL based on a two-beam wakefield acceleration scheme under study at Argonne National Laboratory (ANL). Our beam dynamics simulations were performed using the large-scale self-consistent LW3D code, which accounts for the impact of coherent synchrotron radiation (CSR) on the beam. The overall bunch-compression strategy supporting the generation of high-current bunches for an FEL operating in the water window is presented.

Working group

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