LASER-WAKEFIELD ACCELERATORS AS DRIVERS FOR UNDULATOR-BASED LIGHT SOURCES

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Abstract

Latest developments in the field of laser-wakefield acceleration (LWFA) have led to relatively stable electron beams in terms of peak energy, charge, pointing and divergence. Electron beams with energies of up to 1 GeV have been produced from only few-centimeters long acceleration distances. Driving undulators with these electron beams holds promise for producing brilliant X-ray sources on the university-laboratory scale. In this talk, we will present an experimental breakthrough on this path: our laser-driven soft-X-ray undulator source. In the second part of the talk, we will discuss the physics behind the unique characteristics of laser-wakefield accelerated electron beams such as the intrinsic ultrashort pulse duration (expected to be about 10 fs) and the low normalized transverse emittances (expected to be $< \pi$ mm×mrad). The properties of state-of-the-art wakefield accelerators as well as their limits will be discussed. Finally new schemes to overcome those limits and further improve the beam quality will be presented.

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