

Recent progress on laser plasma accelerator development at Lawrence Berkeley National Laboratory

Kei Nakamura, Ph.D.

BELLA Program, ATAP division
Lawrence Berkeley National Laboratory

Abstract

Since the invention of the Chirped Pulse Amplification lasers (CPA), which won the novel prize in Physics last year, laser plasma acceleration (LPA) research has been pursued all over the world. At BELLA Program, Lawrence Berkeley National Laboratory, there are several laser systems aiming for different applications of the LPAs. There are two hundred-terawatt class laser systems, one is a driver for LPA based light source research, and other for LPA based high quality gamma-ray generation for security. There is a milli-joule kHz laser system, which drives research for medical and ultra-fast diffraction experiments based on LPA. The current status of those three systems will be briefly introduced in the presentation. The BELLA petawatt (PW) laser system [1] is a driver for high energy physics related activity. Recently, we have established the world-record energy for LPA electron beams [2]. This high-energy experiment as well as recent work on effects of spatio-temporal coupling of the laser pulse on LPA will be discussed in this presentation.

[1] K. Nakamura et al., IEEE J.Q.E. 53 (2017) 1200121.

[2] A. J. Gonsalves et al., PRL 122 (2019) 084801.