Development of laser-plasma accelerator with multi-PW laser pulses

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The laser wakefield acceleration (LWFA) is one of the most attractive methods for next generation electron accelerators because it provides huge acceleration field larger by three orders of magnitude than that of conventional rf accelerators. The development of PW lasers has prompted the investigation of a new regime in laser electron acceleration. We have developed two PW Ti:Sapphire laser beamlines [1], and successfully applied the PW laser pulses to generate a 3-GeV electron beam [2]. Recently, we demonstrated a new method to stabilize multi-GeV electron beams by controlling the waveform of PW laser pulses [3]. At CoReLS, we have upgraded one of the PW laser beamlines to a 20-fs, 4-PW laser [4], which can offer opportunities to achieve a 10-GeV electron beam and to explore QED effects in nonlinear Compton backscattering process. We present the current status and future plans on developing electron accelerator using the 4-PW laser.

References

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