Ultrahigh Field Physics via Laser Wake-Field Accelerator on Dual Beam Ultrafast High-Power Laser

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Electron–photon scattering is one of the most fundamental mechanisms in electrodynamics, underlying laboratory and astrophysical sources of high-energy X/gamma-rays. After a century of studies, it is only recently that sufficiently high electromagnetic field strengths have been available to experimentally study the nonlinear regime of the scattering in the laboratory. This can act as a new generation of accelerator-based hard X/gamma-ray sources driven exclusively by laser light. One ultrahigh intense CPA laser pulse will act as two means: first used to accelerate electrons by laser-driven wake field (LWFA) to hundreds MeV, and second, from the split beam or LWFA-leftover energy reflected by plasma mirror, to collide on the electron for the generation of X/gamma-rays. Such all-laser-driven X/gamma sources have recently been demonstrated to be energetic, tunable, narrow/broad in bandwidth, short-pulsed and well collimated. Such characteristics, especially from a compact source, are highly advantageous for numerous advanced X/gamma-ray applications. Moreover, the scattering interaction can act a test bed for a high-field QED study. Also, a preliminary plan of laser wake-field accelerator and radiation source in two high-power laser facilities, 0.5PW in SJTU and 2.5PW in TDLI will be presented. Both of the lasers include two independently compressed two beamlines.