

Abstract Submitted
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Thomson Scattering from Ultrashort and Ultraintense Laser Pulses JU GAO, University of Illinois, Urbana-Champaign — Thomson scattering is a process that occurs as an electron perturbed by photons radiates back, giving off information about its own motion. With a conventional laser, this process is linear and Thomson scattering has been used as a standard tool to diagnose electron density and speed profiles. In the intense laser field, the “photon cloud” that dresses the electron, which carries both (ponderomotive) energy and (ponderomotive) momentum, becomes so thick that the radiation sends information about the dressed photons as well, thus reflecting the characteristics of the laser field which includes intensity, phase and pulse profile. This suggests a changed role of the electron, from being a target in the conventional Thomson scattering experiments to functioning as a potential probe for the ultra-intense and ultra-short laser pulses. In a recent publication (PRL, 93, 243001, December 2005), we analyze unique features of the Thomson scattering inside an ultra-intense and ultra-short laser field. Calculation based on classical theory provides detailed relations between the Thomson scattering and the field characteristics. In addition, we show that the symmetry of the radiation can be broken and this symmetry-breaking ties to the “birth time” of the electron inside the field.

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