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Intense Laser Acceleration of Electrons in Highly-Charged Ions to GeV Energies[1] LIANG-WEN PI, ANTHONY F. STARACE, University of Nebraska-Lincoln, S.X. HU, University of Rochester — Recent advances in laser technology have led to the development of short-pulse high-power petawatt lasers, making possible laser intensities of the order of 10^{22} W/cm^2. This development opens the highly relativistic regime of light-matter interactions, raising interest in both practical and fundamental studies. One of the novel phenomena is the acceleration of electrons to GeV energies.[2,3] An electron in a highly-charged ion can be ionized in a laser field at its peak intensity and violently accelerated to nearly the speed of light, then surf on the laser field to GeV energy. We use the Classical Trajectory Monte Carlo (CTMC) method to simulate the intense laser acceleration of electrons in highly-charged ions. For tightly-focused laser fields, we take into account up to fifth order corrections to the paraxial approximation, which lead to longitudinal laser field components in the focus region. We report here our recent finding that *the final-state energies and ejection angles of the electrons depend on the initial target ion positions relative to the laser focus.*

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[2]S. X. Hu and A. F. Starace, Phys. Rev. Lett. **88**, 245003 (2002).
[3]S. X. Hu and A. F. Starace, Phys. Rev. E **73**, 066502 (2006).

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