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Intense Laser Ionization and Acceleration of Electrons in Highly-Charged Ions Using Vortex Laser Beams\textsuperscript{1} LIANG-WEN PI, ANDREW VIKARTEFSKY, ANTHONY F. STARACE, University of Nebraska-Lincoln — Recent advances in laser technology have led to the development of high-power petawatt lasers, making possible laser intensities of the order of $10^{22}$ W/cm$^2$. An electron in a highly-charged ion can be ionized in a laser field at its peak intensity and swiftly accelerated to GeV energies. Our prior investigation of laser acceleration of electrons using linearly-polarized Gaussian beams (with zero orbital angular momentum) has revealed that the final-state energies and ejection angles of the electrons depend on the initial target ion positions relative to the laser focus.\textsuperscript{2} We report here recent simulations of laser ionization and acceleration of electrons using linearly-polarized vortex laser beams (i.e., Laguerre-Gaussian beams), which carry orbital angular momentum and can spin microscopic objects. These simulations show that the inherent spiral phase structure of the vortex beams leads to improved final-state energy and ejection angle distributions of the electrons.

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