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The Effect of Birth Location in an Intense Laser Focus on the Non-Sequential Double Ionization Yield JAY PAQUETTE, JAN CHALOUPKA, College of William and Mary — Atoms in an intense laser field can become doubly ionized through a direct process known as rescattering, where a single electron is liberated through tunnel ionization and is driven back to the ion core by the laser field, leading to impact ionization and release of a second electron. In this quasi-classical description, the trajectory of the first electron will have a strong influence on the probability of release of a second electron, as evidenced by the reduction in yield with elliptical laser polarization. Even with linear polarization, the first electron can avoid a reencounter with the ion due to the $v \times B$ term or the longitudinal electric field component (E_z) in the laser focus. Since the E_z term is given from the requirement of zero divergence of the electric field, its magnitude will vary as a function of position within the laser focus. Using completely classical 3-D simulations, we demonstrate how longitudinal electric field variations affect electron trajectories, how the ion yields from various regions within the focus are affected, and the likelihood of observing this effect experimentally.

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