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The Role of Transverse Momentum in Electron Vortex Beam Ionization Collisions[1] ALEXANDER PLUMADORE, ALLISON HARRIS, Illinois State University — The recent experimental realization of electron vortex beams (EVB) has prompted numerous proposed applications in fields from electron microscopy to control and manipulation of individual molecules. These new beams have many unique characteristics, such as transverse momentum and quantized orbital angular momentum. Despite the growing interest in applications of EVBs, there is a limited understanding of their fundamental interactions with matter at the atomic scale. Collisions between EVBs and atomic targets can provide insight into these interactions. I present fully differential cross sections for the ionization of ground and excited state atomic hydrogen using EVBs. I show that the projectile's transverse momentum can significantly alter the ionized electron angular distributions in both the scattering plane and the full three-dimensional geometry. Additionally, the ionized electron's ejection angle can be controlled by the vortex opening angle, a feature unique to vortex projectiles. Finally, I demonstrate that the inherent uncertainty in the vortex projectile's momentum transfer leads to a broadening of the classical binary peak, making signatures of the target electron density more readily observable and can be used to infer target structure information.

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