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Scattering Processes using Unique Particle Wave Forms[1] ALLISON HARRIS, ALEXANDER PLUMADORE, ZORYANA SMOZHANYK, Illinois State University — Recent experimental work has succeeded in producing electron wave packets with unique features. One such case is that of an electron vortex beam in which the electrons carry discrete amounts of orbital angular momentum. Another new electron wave packet in the form of an Airy function has also been generated experimentally. Airy wave packets are minimally dispersive, exhibit force-free acceleration, and can self-heal. All of these newly generated particle wave forms open the door to countless applications such as the control and rotation of nanoparticles, improved resolution in electron microscopy, characterization of chiral structures, and many others. In order for possible applications to be realized, it is necessary to understand how these newly generated wave forms interact with matter at a fundamental level. Unfortunately, there is very little work, either experimentally or theoretically, regarding the basic interactions of these electron wave packets with individual atoms or molecules. We present here theoretical studies of electron vortex and Airy beam scattering processes, including ionization and tunneling.

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