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Structures in triply differential cross sections[1] JOSEPH MACEK, University of Tennesse and Oak Ridge National Laboratory — Triply differential cross sections present the momentum distribution $P(\boldsymbol{k})$ of electrons ejected from matter by particle impact. These distributions are used to extract insights about dynamical processes. Unusual, non-smooth, features play important roles in identifying essential features of the atomic dynamics. Our work has found a new source of structure in momentum distributions, namely, vortices in the time-dependent wave function for the dynamical system. We show that these vortices are formed when angular momentum is transferred from relative to internal motion. This angular momentum is normally thought to reside in bound states, however, it can also be carried by electrons ejected from target species. In the latter case the non-zero angular momentum is associated with regions where the electron distribution vanishes. Such regions have "holes" in the triply differential cross sections, thus giving rise to new, unexpected structures in electron momentum distributions. We illustrate these structures by calculations of triply differential cross sections for proton and electron impact on atomic species.

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