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Vortices for K-shell ionization of carbon by electron impact\textsuperscript{1} S.J. WARD, University of North Texas, J.H. MACEK, University of Tennessee — Using the Coulomb-Born approximation \cite{1}, we obtained a deep minimum in the TDCS for K-shell ionization of carbon by electron impact \cite{2,3}. The minimum is due to a vortex in the velocity field \cite{2,3}. We considered the electron to be ejected in the scattering plane, which we took to be the xz-plane. The minimum was obtained for the kinematics of an incident energy $E_i = 1801.2 \text{ eV}$, scattering angle $\theta_f = 4^\circ$, energy of ejected electron $E_k = 5.5 \text{ eV}$, and angle of the ejected electron $\theta_k = 239^\circ$. We analyzed the importance of various multipole components in an expansion of the Coulomb-Born T-matrix \cite{1,3}. We also considered the electron ejected out of the scattering plane for $E_i = 1801.2 \text{ eV}$ and $\theta_f = 4^\circ$ and located the positions of vortices for small but nonzero values of $k_y$, the $y-$component of the momentum of the ejected electron \cite{2}. We constructed the vortex line for the kinematics of $E_i = 1801.2 \text{ eV}$ and $\theta_f = 4^\circ$.

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