Triple Differential Cross Section For Electron Impact Ionization of H_2 and N_2 Molecules

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The interest in ionization of diatomic molecules, such as N_2 and H_2, by charged particle impact sparked the quest for interference effects similar to Young's two-slit experiment. Young type interference effects resulting from the coherent superposition of the scattered waves from two atomic centers were recently predicted by Stia [1] et al. and by Gao et al. [2] for electron impact ionization of molecular hydrogen and molecular nitrogen, respectively. Measurements on the investigation of interference effects on TDCS spectra was reported by several groups [3,4]. The question than is how interference effect changes due to scattering angle or to ejected electron energy in TDCS spectra. The (e,2e) technique investigates electron impact ionization, and provides the most detailed insight into the reaction of many-body systems. However, due to the small cross sections, the experimental investigations of the ionization of small molecules by this technique are very limited. In this context, we have studied electron impact ionization of H_2 and N_2 molecules at intermediate energies [5].

Here we report a study of the interference factor I for 250 eV electron-impact ionization for both an energy scan with a fixed projectile angle and a projectile angle scan with a fixed ejected electron energy. The experimental measurements are performed using a crossed-beam-type electron-electron coincidence spectrometer and theoretical calculations are obtained by using Molecular Three Distorted Wave Approximation (M3DW).

We found that the current model is incomplete and that additional two-center effects are important for these energies. We will discuss that the most important double-slit effect is the incident electron diffracted by two scattering centers during the conference.

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